TECHNICAL MANUAL

MAINTENANCE INSTRUCTIONS

DEPOT

ENGINE ACCESSORIES AND RIGGING PROCEDURES

AIRCRAFT ENGINE
USAF MODEL
F100-PW-229

PRATT & WHITNEY
LARGE MILITARY ENGINES
UNITED TECHNOLOGIES CORPORATION
F33657-84-C-2014
F41608-94-D-0816

THIS PUBLICATION IS ONE OF A SET OF TWELVE MANUALS. THE COMPLETE SET CONSISTING OF T.O. 2J-F100-53-1 THROUGH T.O. 2J-F100-53-11 AND T.O. 2J-F100-11-2 IS REQUIRED FOR DEPOT MAINTENANCE.

PUBLISHED UNDER AUTHORITY OF THE SECRETARY OF THE AIR FORCE

15 AUGUST 1991
CHANGE 30 — 15 AUGUST 1999

RECORD OF CHANGES

Change	Date
Original	15 Aug 91
Change 1	15 Nov 91
Change 2	15 Feb 92
Change 3	15 May 92
Change 4	15 Aug 92
Change 5	15 Nov 92
Change 6	15 Feb 93
Change 7	15 May 93
Change 8	15 Aug 93
Change 9	15 Nov 93
Change 10	15 Feb 94
Change 11	15 May 94
Change 12	15 Aug 94
Change 13	15 Nov 94
Change 14	15 Feb 95
Change 15	15 May 95
Change 16	15 Aug 95
Change 17	15 Nov 95
Change 18	15 Feb 96
Change 19	15 May 96
Change 20	15 Aug 96
Change 21	15 Nov 96
Change 22	15 Feb 97
Change 23	15 May 97
Change 24	15 Aug 97
Change 25	15 Feb 98
Change 26	15 Aug 98
Change 27	15 Nov 98
Change 28	15 Feb 99
Change 29	15 May 99
Change 30	15 Aug 99

TOTAL NUMBER OF PAGES IN THIS MANUAL IS 1028

LIST OF EFFECTIVE FRONT MATTER PAGES

PAGE NO.	CHANGE NO.
Title	30
A - B	30
C Blank	0
VS-1 Deleted	23
VS-2 Blank Deleted	23
a	29
b	22
S-1 - S-3	14
S-4	17
S-5	14
S-6 Blank Added	0

NUMERICAL INDEX OF EFFECTIVE WORK PACKAGES

NOTE

Only those work packages (WPs) and subordinate work packages (SWPs) assigned to this manual are listed in this index.

Insert Change No. 30 WPs and SWPs, dated 15 August 1999. Dispose of superseded WPs and SWPs. If changed pages are issued to a WP or SWP, insert changed pages in applicable WP or SWP. Portion of text affected in a changed WP or SWP is indicated by change bars in outer margin of each column of text. Changes to illustrations are indicated by pointing hands or change bars, as applicable. Changes to wiring diagrams are indicated by shaded areas.

WP/SWP Number	*CHANGE NO.
001 00	24
002 00	23
003 00	0
004 00	0
005 00	17
006 00	0
007 00	8
008 00	30

*Zero in this column indicates an original WP/SWP

NUMERICAL INDEX OF EFFECTIVE WORK PACKAGES (continued)

* Zero in this column indicates an original WP/SWP

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

This is a list of TCTOs applicable to this manual. TCTOs will also be listed in the work packages to which they apply.

T.O. No.	Date	Level	Title (ECP No.)
2J-F100229-562	30 Sep 95	O/I	Retrofit of Generator Cable Connector Clamp PN 4082678-01 and Attaching Hardware, F100-PW-229 Engine, F-15/F-16 Aircraft. (EC 94QA072)
2J-F100229-565	15 Feb 96	O/I	Retrofit of Gearbox Oil Supply Tubes and Manifolds For Improved Gearbox Oil Flow, F100-PW-229 Engine, F-16 Aircraft. (EC 94QA075)
2J-F100229-576	6 Dec 96	O/I	Installation of PN 4084415-01 Bracket Assembly, F100-PW-229 Engine, F-15/F-16 Aircraft. (ECP 96QA080)
2J-F100229(I)-516	30 Nov 96	O/I	Replacement of PN 4075565 and PN 4075566 Compressor Inlet Variable Vane (CIVV) Actuator Rod Clevises, F100-PW-229 Engines, F-15 Aircraft. (ECP 95QA027)

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS (continued)

T.O. No.	Date	Level	Title (ECP No.)
2J-F100229(V)-501	01 Jan 95	O/I	Incorporation of 30 Micron Oil Filter With Full-Flow Bypass Valve, F100-PW-229 Engines, F-15/ F-16 Aircraft.(ECP 90QA167C1)
2J-F100229(V)-514	6 Dec 96	O/I	Modification of PN 4084017, Main Oil Pump Adapter Installation Procedure, F100-PW-229 Engines, F-15/F-16 Aircraft. (EC 96QA080)
6J3-4-117-504	30 Jun 91	O	Upgrade of PN 496521H01D01 Digital Electronic Engine Control to 2.5.0 Logic, F100-PW-229 Engine. (ECP 90QA156C1)

SAFETY SUMMARY

INTRODUCTION

This technical order (T.O.) describes physical and chemical processes which may require the use of chemicals, solvents, paints, or other commercially available hazardous material. This T.O. also describes maintenance actions which may require handling or use of potentially dangerous parts or equipment.

Personnel performing maintenance procedures and practices included in this T.O. shall be familiar with safety precautions and procedures associated with chemicals and other hazardous materials, parts and equipment. The user of this T.O. shall consult their local safety and health staff and Material Safety Data Sheet (MSDS) concerning any questions on hazardous chemicals, personal protective equipment requirements, and appropriate handling and emergency procedures. The user shall become completely familiar with the manufacturer/supplier information and adhere to the procedures, recommendations, warnings, and cautions of the manufacturer/supplier for the safe use, handling, storage, and disposal of these materials. Disregarding safety precautions and procedures or performing unauthorized maintenance can cause engine or equipment damage, serious injury, illness, or death.

WARNING, CAUTION, and NOTE STATEMENTS

WARNING

Highlights an essential operating or maintenance procedure, practice, condition, or statement which, if not strictly observed, could result in personal injury, loss of human life, or an acute/chronic health hazard.

CAUTION

Highlights an essential operating or maintenance procedure, practice, condition, or statement which, if not strictly observed, could result in equipment damage or destruction.

WARNINGS (for personnel protection) or CAUTIONS (for equipment protection) precede selected procedures in this T.O. for additional emphasis. WARNINGS and CAUTIONS are used where emphasis beyond the general safety precautions and instructions are required because the equipment, procedures, or work environment represents an unusual situation (nonroutine use or application) to the technician. The WARNING or CAUTION applies each time the related step is repeated.

NOTES

A note describes an unusual procedure or condition which special attention must be paid for a particular reason.

Notes are not part of safety. A note does not replace a warning or caution.

SAFETY SUMMARY (continued)

BACKUP WRENCH

When torquing or breaking torque on any tube coupling nut, use a suitable wrench to apply torque to the fitting to which the part is attached. Failure to properly use a backup wrench can result in failure of tubes and accessories due to stress loading during torquing procedures.

BEARING HANDLING

The most common cause of bearing damage is attributed to improper preservation and mishandling. Do not handle bearings with bare hands. Wear approved gloves when handling bearings. Coat bearings with engine oil and store in labeled containers as matched sets. Ensure all bearing components have matching serial numbers before installation to prevent bearing failure due to mismatched contact surfaces.

BRAZING, SOLDERING AND WELDING

Brazing, soldering and welding operations may produce fumes that can be harmful to breathe. Arc welding emits ultraviolet light, which can burn the skin and eyes. Provide adequate ventilation. Wear protective clothing/equipment. Ensure gas bottles are properly secured.

CABLES, ELECTRICAL

Small radius bends or severe flexing of electrical cables can result in damage to conductors and/or outer braid.

CARBON SEALS AND SEAL SEATS

Carbon seals and carbon seal seats are easily damaged and shall be handled with care. Do not allow carbon seals to come in contact with petroleum based solvents. These solvents will reduce the lubricity of the carbons and result in rapid seal wear. Do not handle carbon seals or seal seats with bare hands. Wear approved, lint free gloves.

CHEMICAL COMPOUNDS AND SOLUTIONS

Many of the chemical compounds and solutions used in cleaning, inspection, and repair may cause irritation to the skin, eyes, and respiratory system. Many of the chemicals, including their vapors, may be poisonous, easily ignited, corrosive, and react violently with incompatible materials. Improper mixing and combining of these chemicals may produce violent reactions, rapid heat generation, and explosive/toxic gases. Heating certain chemicals may cause toxic gases to be produced. Observe manufacturer’s warning labels and Material Safety Data Sheet (MSDS) instructions for proper handling, storage, and disposal. Consult the local Safety Office for additional information.

COMPRESSED AIR

Compressed air can generate flying debris and can cause severe injury if air blast penetrates the skin or eyes. Reduce compressed air pressure for cleaning or drying to less than 30 psig. Use with effective chip guarding and personal protective equipment. Do not direct air blast toward other personnel.

SAFETY SUMMARY (continued)

COMPRESSED GASES

Many compressed gases are highly flammable/explosive and can cause suffocation at varied levels of concentration or exposure time. Some of the gases can freeze body tissue. Keep ignition sources away. Provide adequate ventilation. Wear protective clothing/equipment. Store in properly marked/labeled containers at approved locations. Do not use in confined areas which may create an explosive atmosphere. Refer to specific Material Safety Data Sheet (MSDS) for additional information.

DANGEROUS PRESSURE

Pressure system precautions apply to all equipment using gases and fluids at all ranges of pressure. To avoid injury, stand clear of tooling and parts being pressure tested when pressure is being applied. Proper tool installation, shielding and hose connections shall be ensured before applying pressure. Ensure all system components are compatible with pressures applied and pressure medium used. Pressure shall be applied slowly.

ELECTROSTATIC DISCHARGE (ESD)

Circuit card assemblies and their related components may be damaged by undetectable electrostatic discharge. Care shall be used during handling or repair of these items. Use electrostatic discharge precautionary standard operating procedures.

ENGINE AND ACCESSORIES - TEMPERATURE

Aircraft engines and accessories are extremely hot following operation. Allow sufficient time to cool or wear protective clothing/equipment when maintenance or inspection tasks are required following engine operation. Failure to comply may result in injury to personnel.

ENGINE AND CONTROLS PRESERVATION

Engines and engine controls shall be drained of all fuel and preserved before shipping. Failure to drain fuel can result in a fire hazard. Engine preservation replaces any fuel with oil, which acts as a corrosion preventing agent.

FOREIGN OBJECT DAMAGE (FOD)

Foreign objects can enter engine compartments and accessories during maintenance. Always be aware of the potential for foreign object damage (FOD) entering any uncovered opening of an engine or accessory. Always thoroughly clean parts and compartments to remove all foreign material. Make a final detail inspection of the work area when the job is finished. Follow standard operating procedures for tool and equipment accountability.

FOOD AND TOBACCO

Wash hands and face thoroughly prior to smoking tobacco products or eating food. Residue of the materials used in engine and equipment maintenance can cause serious health problems if ingested or inhaled in the smoke.

HEARING PROTECTION

The frequency and intensity of noise generated during some operations may cause an acute or chronic hearing impairment. Wear approved hearing protection equipment. Contact the local safety office or bioenvironmental engineering for further guidance.

SAFETY SUMMARY (continued)

HYDRAULIC TOOLING

Application of hydraulic pressure to tooling or engine parts can cause them to jump with enough force to cause personal injury. Excessive pressure applied to tooling by a hydraulic pump can cause a structural failure to the engine part and/or the tooling which could result in personal injury. Using a ram with a nonapproved part number or exceeding hydraulic pump pressure can result in excessive pressure being applied to tooling. Do not exceed ram capacity for a given tool. Stand clear of tooling and engine parts during hydraulic tool operations.

JEWELRY

Remove rings, watches, necklaces, and other metallic objects that may be snagged or cause shock or burn hazards.

LEAD SEALS

Lead seals shall only be removed when specifically called for in the procedures. Lead seals identify areas of critical adjustment that can only be attained at the Depot or Vendor level.

LIFTING, ROTATING, AND SUPPORTING

Personnel shall stay clear of objects being lifted during hoist operations or when objects are supported by temporary transition supports. To prevent personal injury, use adequate number of personnel and appropriately rated lifting/handling devices to lift or move objects. Unless specified in the procedures, personnel shall not work on objects suspended by a hoist or supported by temporary transition supports. Personnel shall be prepared for potential unbalanced conditions during hoist operations.

LIVE ELECTRICAL CIRCUITS

Do not work on electrical systems, replace components, or make adjustments to equipment with the electrical supply turned on. Under certain conditions, danger may exist even when the power control is in the "off" position due to charges retained by capacitors. To avoid injuries, always remove power from, discharge, and ground a circuit prior to servicing. Adhere to all lock-out/tag-out requirements.

MAINTENANCE STANDS AND FIXTURES

Ensure modules or assemblies are firmly secured to work stands or fixtures before performing maintenance procedures. Personal injury or damage to modules or assemblies may occur if a work stand or fixture slips.

METAL MACHINING PROCESSES

Metal machining processes may generate dust, fumes, filings, and/or shavings which may cause acute/chronic irritation to the skin, eyes, digestive tract, and respiratory system. Metallic dust vapors may form a fire hazard when exposed to heat, flame, or when in contact with oxidizing agents. Prior to performing any metal machining process, personnel shall consult their local safety and health staff and the Material Safety Data Sheet (MSDS) to become familiar with the hazards and protective measures for a specific metal.

SAFETY SUMMARY (continued)

MOVING ENGINE

Do not move an engine on work stand rails or transportation trailer without having installed proper supports, tie-rods, and flange adapters. Engine may shift or fall off rails and cause injury to personnel. When moving engine, do not push on engine. Use the engine support mount assemblies as a push point.

PACKING LUBRICATION (OIL AND FUEL SYSTEMS)

Use only the lubricant specified in the technical order to lubricate fuel and oil system packings. Use of an incompatible lubricant can cause oil foaming, clogging of critical fuel system filters, and packing deterioration leading to leakage, possible fire and engine shutdown.

PROTECTIVE CLOSURES AND COVERS

Install protective closures on all plumbing and components immediately upon removal. Install protective covers on engine modules, assemblies, parts, and compartments when not being worked.

QUICK RELEASE PINS

Do not force quick release pins into place as this may damage the self-locking feature of the pins. The compatibility of quick release pins is determined by the part number. Intermixing of pin part numbers during installation can result in loss of or failure of the quick release pins.

SHARP EDGED BLADES

Many blades have sharp edges. Wear protective gloves when handling bladed rotors and when installing or removing blades from rotors. Blades should only be used in their designed holder or rotor.

SUPER-CHILLED/HEATED PARTS AND EQUIPMENT

Super-chilled or heated parts and the equipment or agents used to heat or chill can cause burns, frostbite, or both. Wear temperature resistant gloves and other related protective clothing/equipment when handling chilled or heated parts or equipment. Super-chilled parts are fragile due to a lower resistance to impact. Heating parts beyond specified temperature limits can degrade heat treat qualities and result in part failure.

TEMPERATURE NORMALIZING

Allow heated or chilled parts to reach room temperature before applying final torque to fasteners. Failure to comply may result in improperly seated parts and/or mistorqued fasteners.

WORK BOLTS AND WORK NUTS

Work bolts and work nuts shall be permanently marked to distinguish them from engine bolts and nuts. Do not apply lubricants to work bolts and work nuts that will be replaced by engine bolts and nuts which require a thread sealant. Sealants will not adhere to threads contaminated with lubricants.

WORK PACKAGE

ALPHABETICAL INDEX

ENGINE ACCESSORIES AND RIGGING PROCEDURES

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 6

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	24	4	24	5	0
2 - 3	0			6 Blank	0

ALPHABETICAL INDEX

ALPHABETICAL INDEX (continued)

ALPHABETICAL INDEX (continued)

ALPHABETICAL INDEX (continued)

WORK PACKAGE

INTRODUCTION AND PICTORIAL INDEXES

ENGINE ACCESSORIES AND RIGGING PROCEDURES

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 14

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	23	4 Blank	0	8 Blank	0
2	9	5	0	9	0
2A	23	6 Blank	0	10 Blank	0
2B Blank Added	9	7	0	11	4
3	0			12 Blank	0

1. INTRODUCTION.

a. This technical order contains depot maintenance instructions for engine accessories and rigging procedures used on the F100-PW-229 engine.

2. TECHNICAL ORDER ARRANGEMENT.

a. This technical order is divided into two main groups; accessory work packages and rigging work packages. A series (block) of work package numbers is assigned each group. The following T.O. outline illustrates these groupings:

WP Block Number	Subject
001 00	Alphabetical Index
002 00	Introduction
003 00	Accessories Covered by Separate Publication
004 00 through 009 00	Engine Accessories
100 00 through 199 00	Rigging Procedures
200 00	Table of Limits

b. Accessory work packages are further arranged by system. All fuel system accessories are grouped together as are the oil system work packages and electrical system work packages. The pictorial indexes are based on these groupings.

c. Unlike work packages in other TOs, the accessory work packages contain all functions of the component. Instructions for removal, installation, cleaning, inspection, and repair of a component are all located within the same work package.

3. PICTORIAL INDEX.

(See FO-1 through FO-4.)

a. The pictorial index is a visual aid for matching an accessory with a work package. Accessories are grouped by system (fuel, oil, electrical, etc) within the pictorial index.

4. TYPICAL PART NUMBER.

a. When the word typical precedes a part number it means that this part number is one of several that may be used in this location. By referring to this typical part number in the Illustrated Parts Breakdown (IPB) manual (T.O. 2J-F100-54), all part numbers applicable to this location can be found. When a part number is used without the word typical, it means that the procedure applies only to that part number.

4A. LOCALLY MANUFACTURED SUPPORT EQUIPMENT.

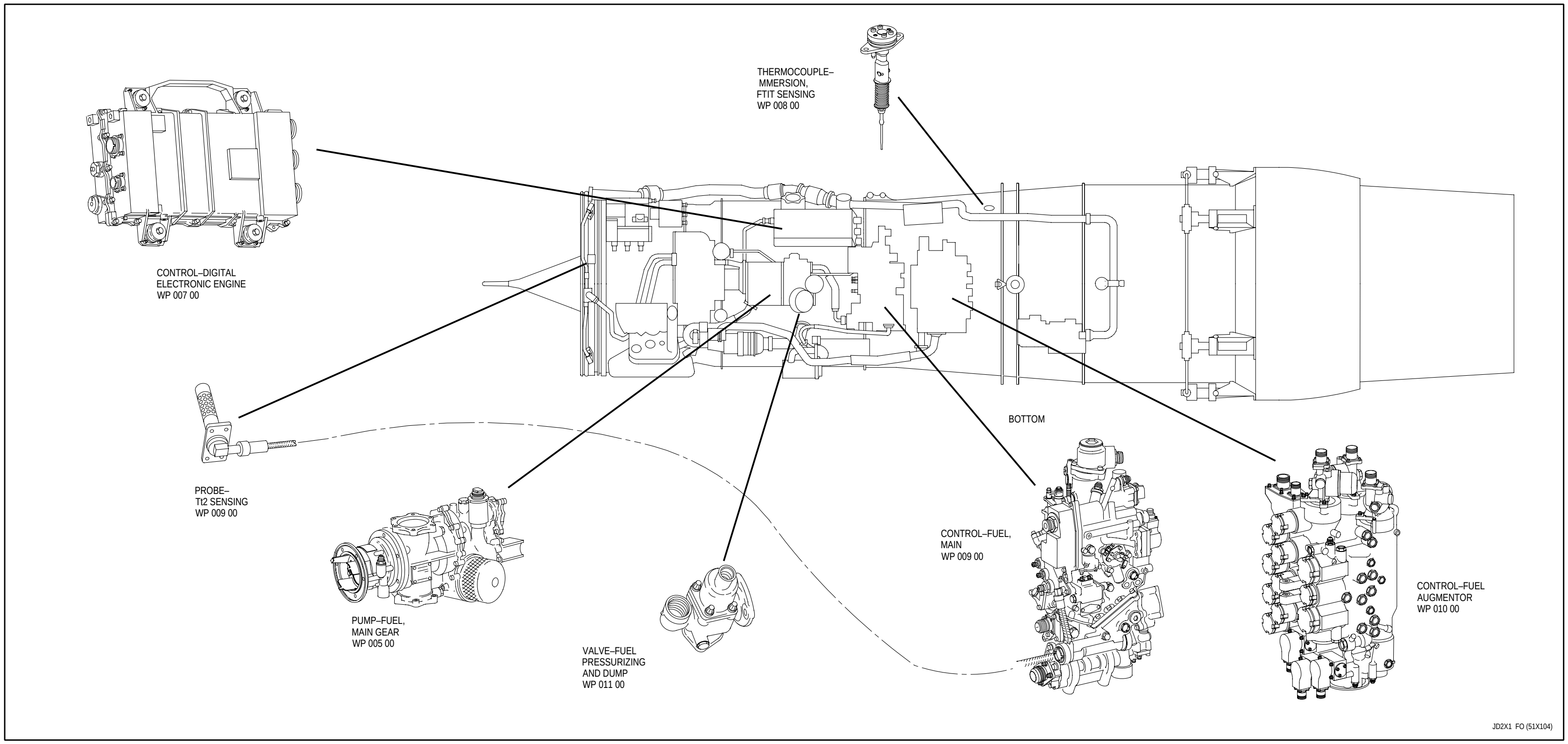
a. Locally manufactured support equipment may be manufactured by using activity or by supplier.

b. Locally manufactured support equipment is in Master Numerical List of Support Equipment in T.O. 2J-F100-53-3, and Applicable Support Equipment and Illustrated Support Equipment sections of maintenance WPs/SWPs.

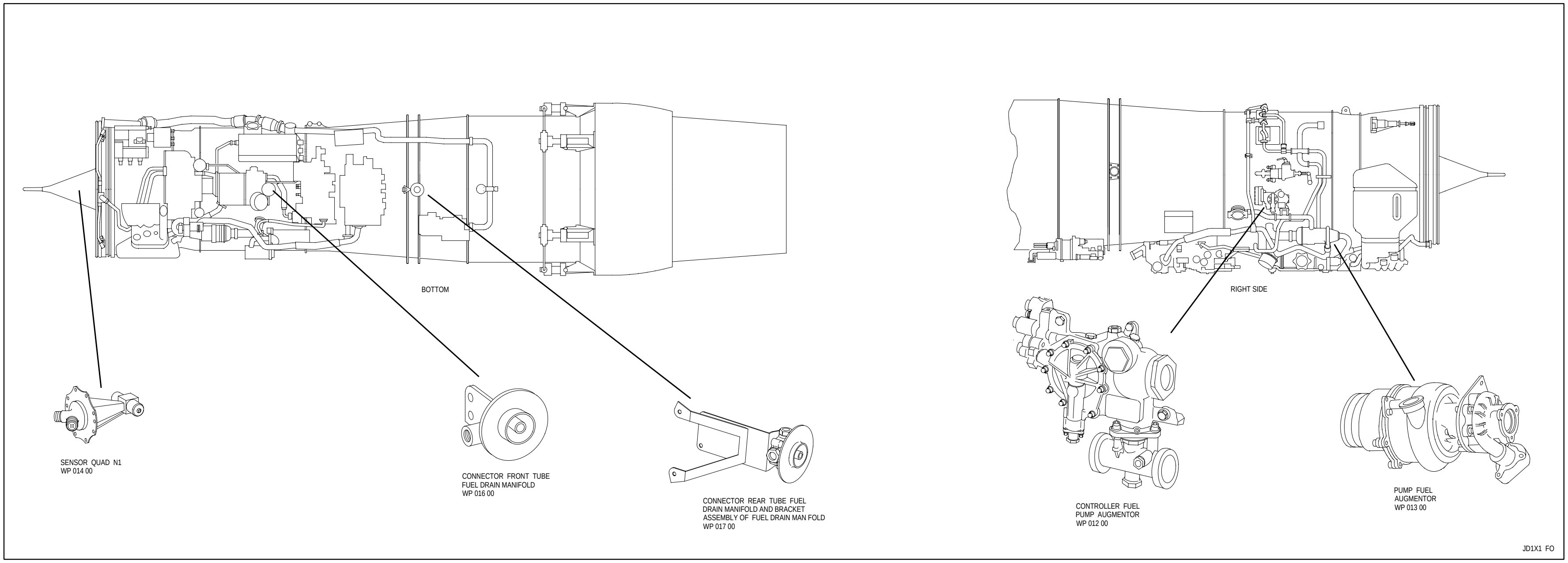
c. Locally manufactured support equipment is identified in these WPs/SWPs by prefix LM and four digit number (LM 1003), or by prefix LM followed by PWA number (LM PWA 51203).

5. CHANGE REQUEST.

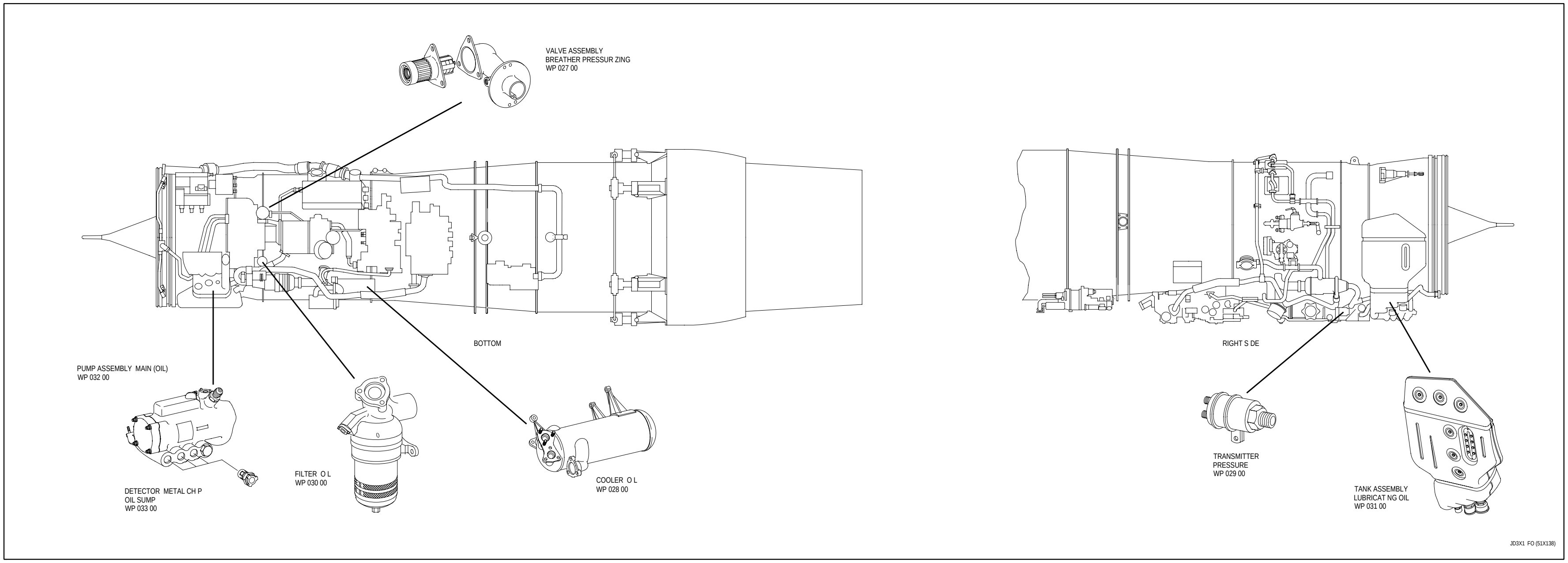
a. Recommendations for specific changes to this technical order shall be submitted on an AFTO Form 22 to SA-ALC/LPCQ(TOMA), Kelly AFB, TX 78241-6421 in accordance with T.O. 00-5-1.



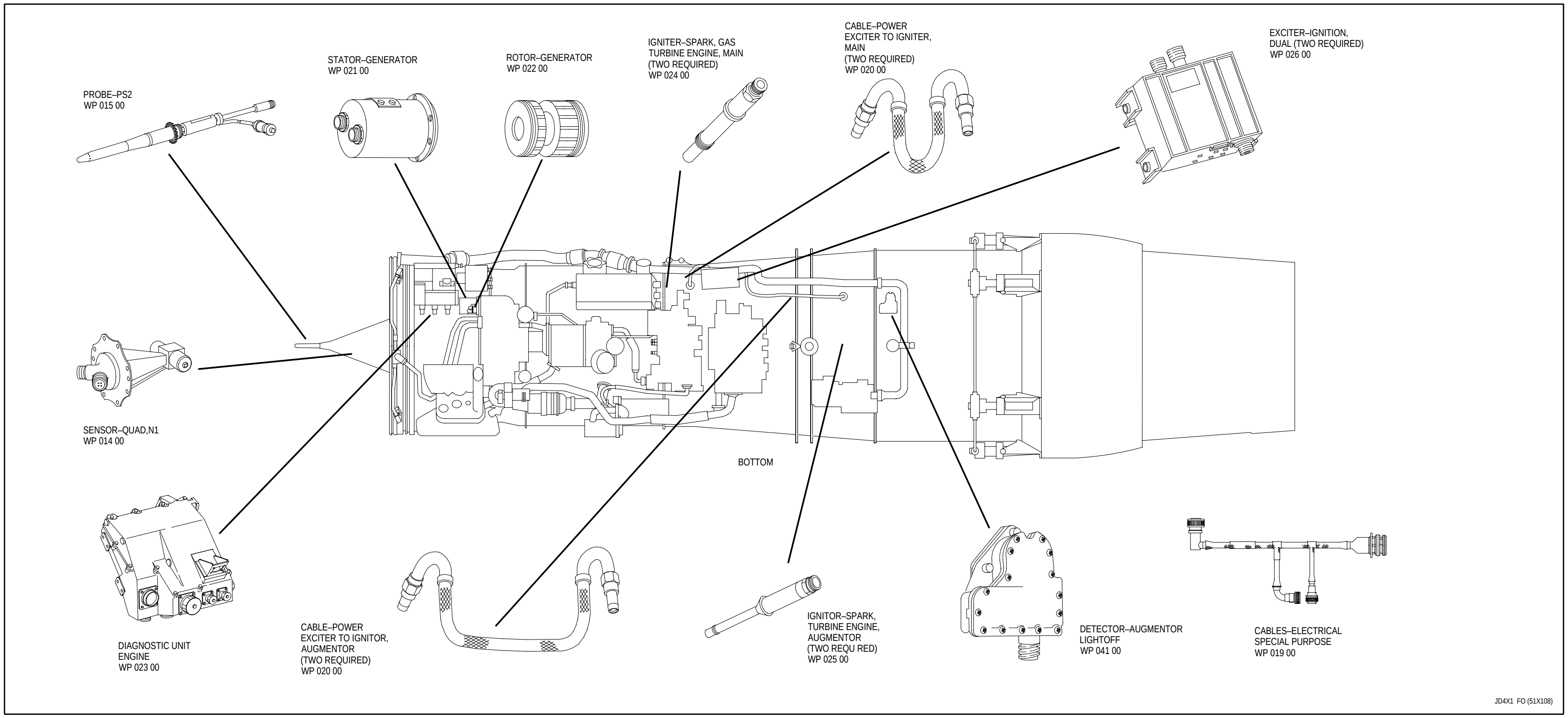
FO-1. Engine Fuel System - Pictorial Index (Sheet 1 of 2)



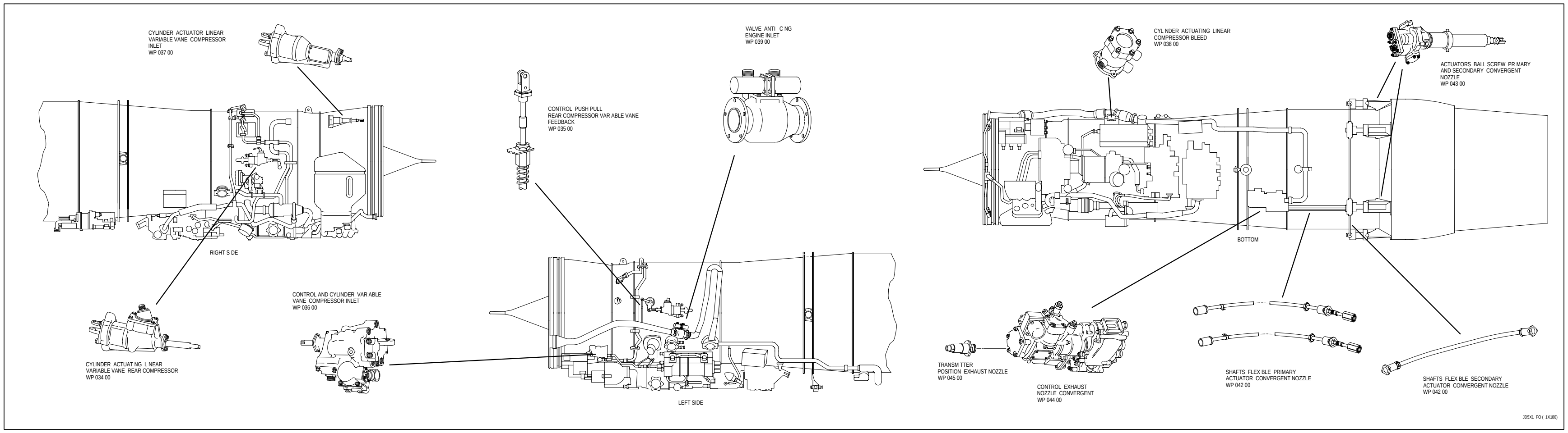
FO-1. Engine Fuel System - Pictorial Index (Sheet 2 of 2)



FO-2. Engine Oil System - Pictorial Index



FO-3. Engine Electrical System - Pictorial Index



FO-4. Miscellaneous Systems - Pictorial Index

WORK PACKAGE

TECHNICAL PROCEDURES

ACCESSORIES COVERED BY SEPARATE PUBLICATIONS

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 3	0				
4 Blank	0				

1. INTRODUCTION.

(See Table 1.)

a. Overhaul instructions for major engine accessories are not provided in this T.O. Table 1 lists these accessories, their manufacturers, and publication designations in which complete overhaul instructions will be found.

Table 1. Accessories Covered By Separate Publications

Accessories	Part Number	Manufacturer/FSCM*	Publication Designation
Actuators - Ball Screw, Primary, Convergent Nozzle	4076324	Bendix Corporation Energy Controls Division	T.O. 16A1-14-43-3
Actuators - Ball Screw, Secondary, Convergent Nozzle	4076323	Bendix Corporation Energy Controls Division	T.O. 16A1-14-43-3
Control - Engine, Digital Electronic	4074633DO1	Hamilton Standard Division	T.O. 6J3-4-117-2 T.O. 6J3-4-117-3
Control - Exhaust Nozzle, Convergent	4076322	Bendix Corporation Energy Controls Division	T.O. 6J3-8-21-3
Control - Fuel, Main	4070897	Bendix Corporation Energy Controls Division	T.O. 6J3-4-118-13 T.O. 6J3-4-118-2-1 T.O. 6J3-4-118-2-2 T.O. 6J3-4-118-3 T.O. 6J3-4-118-8-1
Control and Cylinder - Variable Vane, Compressor Inlet	4067837	Bendix Corporation Energy Controls Division	T.O. 6J27-7-3
Cylinder - Actuating, Linear, Variable Vane, Compressor Inlet	4067838	Bendix Corporation Energy Controls Division	T.O. 6J27-6-3
Cylinder - Actuating, Linear, Variable Vane, Rear Compressor	4061378	Bendix Corporation Energy Controls Division	T.O. 6J27-8-3
Diagnostic Unit - Engine	4073166DO1	Hamilton Standard Division	T.O. 5E1-2-15-3
Exciter - Ignition Dual	4060998	Simmonds Precision Engine Systems Division	T.O. 8E1-8-34-3

Table 1. Accessories Covered By Separate Publications (continued)

Accessories	Part Number	Manufacturer/FSCM*	Publication Designation
Pump - Fuel, Augmentor	4071353	Hamilton Standard Division	T.O. 6J10-2-18-3
Pump - Gear, Main Fuel	4065756	TRW	T.O. 6J10-4-93-3
Transmitter - Position, Nozzle	4057374	Bendix/Courter	T.O. 5E12-26-3
Valve - Anti-icing, Engine Inlet	4066725	Whittaker Controls	T.O. 15E2-4-20-3
Valve - Fuel Pressurizing and Dump	4062056	Sterer Engineering	T.O. 6J15-14-16-3

WORK PACKAGE

INTRODUCTION

ACCESSORIES, ENGINE EXTERNAL

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 3	0	4 Blank	0		

1. INTRODUCTION.

a. This work package introduces the 004 00 through 099 00 series work packages for engine external accessories. The following work packages are included in this series:

WP No.	Title
005 00	Pump - Gear, Main Fuel
006 00	Coupling Half - Quick-Disconnect, Ratchet Lock
007 00	Control - Engine, Digital Electronic
008 00	Thermocouple - Immersion, FTIT Sensing
009 00	Control - Fuel, Main
010 00	Control - Fuel, Augmentor
011 00	Valve - Fuel Pressurizing and Dump
012 00	Controller - Fuel Pump, Augmentor
013 00	Pump - Fuel, Augmentor
014 00	Sensor - Electrical, Quad N1
015 00	Probe - Ps2 Assembly
016 00	Connector, Front - Tube, Fuel Drain Manifold
017 00	Connector, Rear - Tube, Fuel Drain Manifold and Bracket
018 00	Probe Assembly - Total Pressure (Pt6)
019 00	Cables - Electrical, Special Purpose
020 00	Cables - Power, Exciter to Igniter
021 00	Stator - Generator
022 00	Rotor - Generator
023 00	Diagnostic Unit - Engine
024 00	Igniter - Spark, Gas Turbine Engine, Main
025 00	Igniter - Spark, Gas Turbine Engine, Augmentor

WORK PACKAGE

TECHNICAL PROCEDURES

PUMP - GEAR, MAIN FUEL

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 24

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	17	12	17	18	0
2	0	13	0	19	10
3	17	14 - 16	17	20 - 22	16
4 - 5	16	17	2	23	0
6 - 11	0			24 Blank	0

REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information	T.O. 2J-F100-53-1
Painting, Zinc Chromate Primer (AMS 3110) (SPOP 157)	SWP 097 10
On-Condition Maintenances	T.O. 2J-F100-53-2
Engine Fuel System Contamination	WP 015 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
BARRIER, BAG MATERIAL	MIL-B-81705, TYPE II
CLOTH, DRY LINT-FREE	-
COMPOUND, ANTIGALLING (PWA 550)	HI-T 650 OR LUBRI-BOND HT
LOCKWIRE(0.032 INCH DIAMETER)	MS9226-04
OIL, LUBRICATING	MIL-L-7808
PETROLATUM	VV-P-236
PRIMER, ZINC CHROMATE (AMS 3110)	TT-P-1757
SOLVENT, PETROLEUM	P-D-680, TYPE II

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
ELEMENT, FUEL FILTER	217380	1
GASKET	ST2284-16	2
INSERT, HELICAL COIL	MS21209F4-15	AS REQUIRED
INSERT, HELICAL COIL	MS21209F4-20	AS REQUIRED
PACKING, PREFORMED	M25988-1-117	2
PACKING, PREFORMED	M25988-1-132	2
PACKING, PREFORMED	M25988-1-242	1
PACKING, PREFORMED	MS9966-04	1
PACKING, PREFORMED	MS9966-06	4
PACKING, PREFORMED	MS9966-08	1
PACKING, PREFORMED	MS9967-133	1
PACKING, PREFORMED	MS9967-214	2
PACKING, PREFORMED	MS9967-225	1
PACKING, PREFORMED	MS9967-235	2
PACKING, PREFORMED	ST1000-215	1
PACKING, PREFORMED	ST1000-241	1

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
8	MAIN FUEL GEAR PUMP - FUEL FILTER ELEMENT REPLACEMENT	
	LISLE STRAP WRENCH -	PN 63500

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures for the main fuel gear pump:

- Removal
- Removal of attaching parts
- Cleaning
- Helical coil inserts - Inspection
- Helical coil inserts - Replacement
- Fuel filter - Inspection
- Fuel filter - Replacement
- Installation of attaching parts
- Installation
- Storage and shipment

2. MAIN FUEL GEAR PUMP - REMOVAL.

(See Figure 1.)

a. Disconnect tube and hoses from front fuel drain manifold tube connector. (See figure 1, Sheet 1.)

b. Disconnect hinged, cushioned loop clamp securing white cable and Tt2 probe capillary tube.

c. Remove bolts securing hose a ssembly (PF2) and bracket to main fuel gear pump.

d. Discard packing. Install protective closures.

e. Loosen tube nuts attaching Pf1 gas generator bypass to main fuel pump tube to tube elbow and main fuel control connector. Remove bolt and nut securing tube loop clamp.

f. Remove tube. Discard gaskets. Install protective closures.

g. Remove bolts securing tube elbow to main fuel pump. Remove tube elbow. Discard packing.

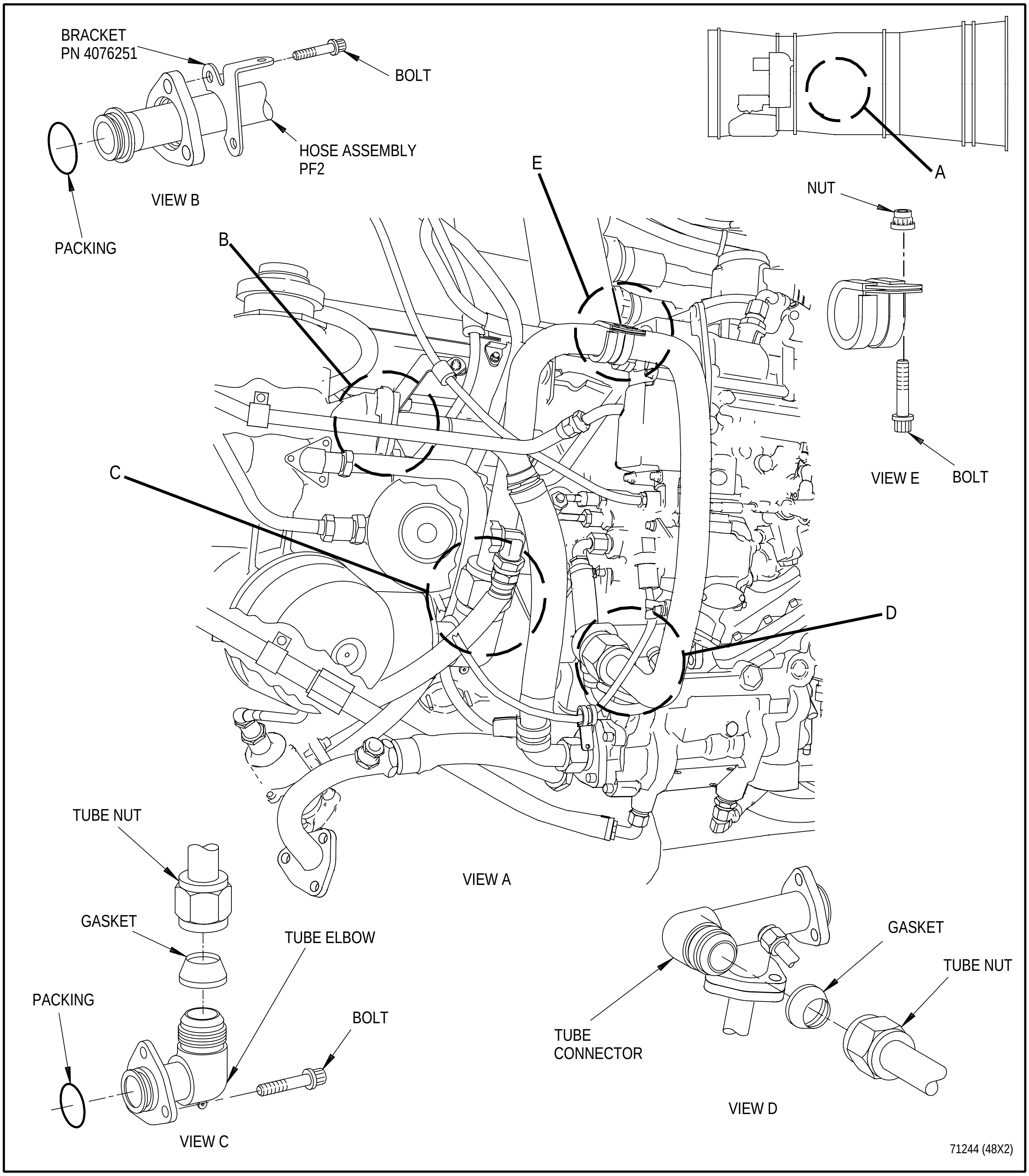


Figure 1. Main Fuel Gear Pump - Removal (Sheet 1 of 3)

h. Disconnect bolts and nuts securing augmentor fuel pump PF1 tube elbow and remaining tubes from main fuel gear pump. (See figure 1, Sheet 2.) Discard packings. Install protective closures to ends of tubes.

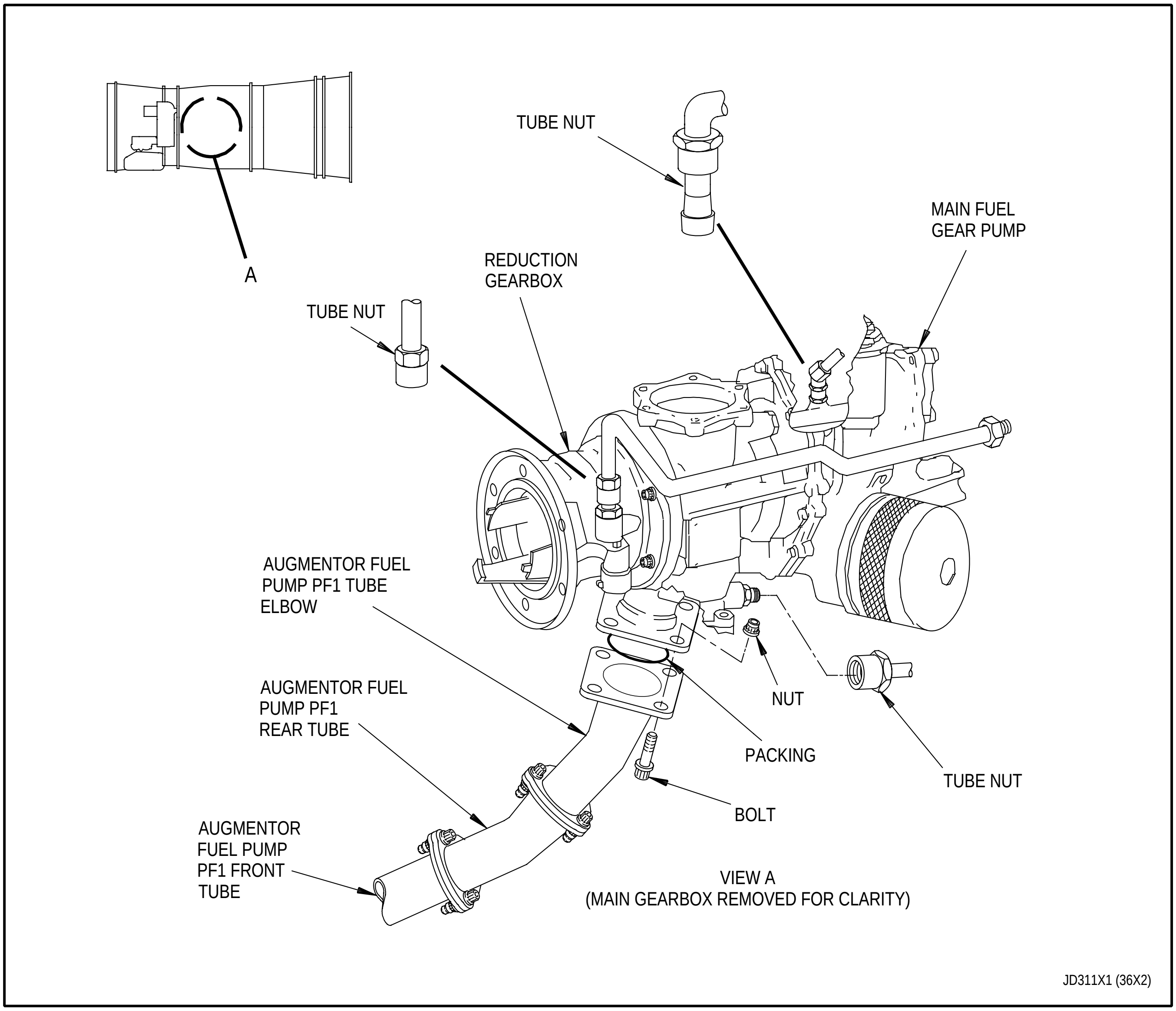


Figure 1. Main Fuel Gear Pump - Removal (Sheet 2 of 3)

CAUTION

To prevent spline damage, gear pump shall be supported on horizontal line with main gearbox during removal.

i. Remove nuts, washers, and bracket securing gear pump to reduction gearbox. (See figure 1, Sheet 3.)

j. Remove bolts securing retaining links to gear pump.

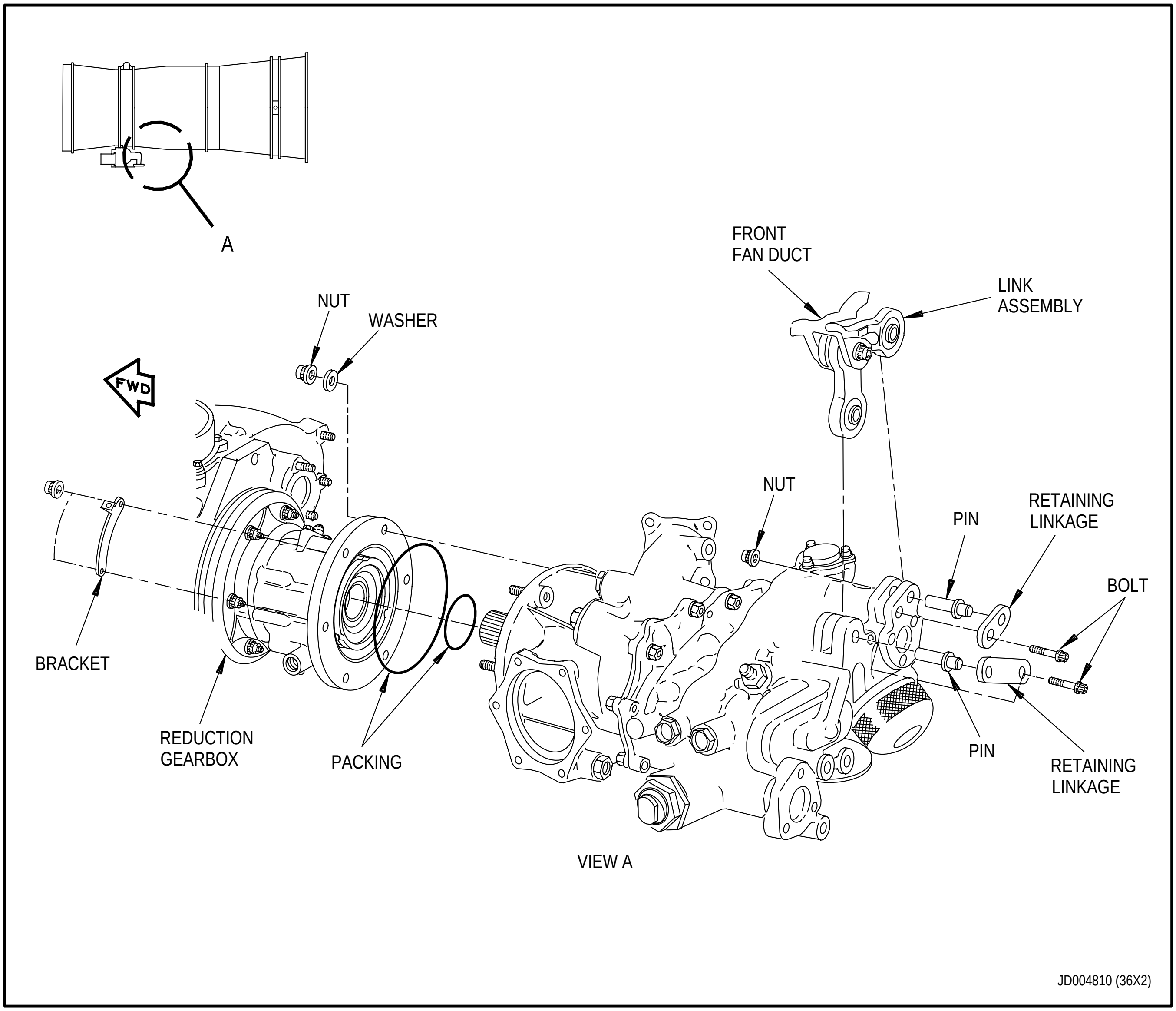


Figure 1. Main Fuel Gear Pump - Removal (Sheet 3 of 3)

k. Support gear pump and remove pins from gear pump mount and link assemblies.

l. Pivot link assemblies clear of mount and remove gear pump.

3. MAIN FUEL GEAR PUMP - REMOVAL OF ATTACHING PARTS.
(See Figure 2.)

a. Remove adapters from ports marked PF1 and EECSF1. Discard packing. (See figure 2.)

b. Remove caps and adapters from ports marked SRF1, PDF1, PDF2, and PFO. Discard packings.

c. Remove plug and packing. Discard packing.

d. Remove bolts and washers securing quick-disconnect coupling half to pump. Remove coupling half and packing. Discard packing.

e. Remove bolts and washers securing cover to fuel inlet port. Remove cover and packing. Discard packing.

4. MAIN FUEL GEAR PUMP - CLEANING.

CAUTION

Do not immerse pump in solvent. Immersion may cause corrosion damage to internal pump parts.

a. Wipe exterior of pump with clean cloth moistened with P-D-680, Type II petroleum solvent.

b. Dry with clean, dry, lint-free cloth.

5. MAIN FUEL GEAR PUMP - HELICAL COIL INSERTS INSPECTION.

a. Visually inspect helical coil inserts as follows:

(1) Check inserts for stripped or crossed threads and looseness. Replace worn inserts. Refer to paragraph 6.

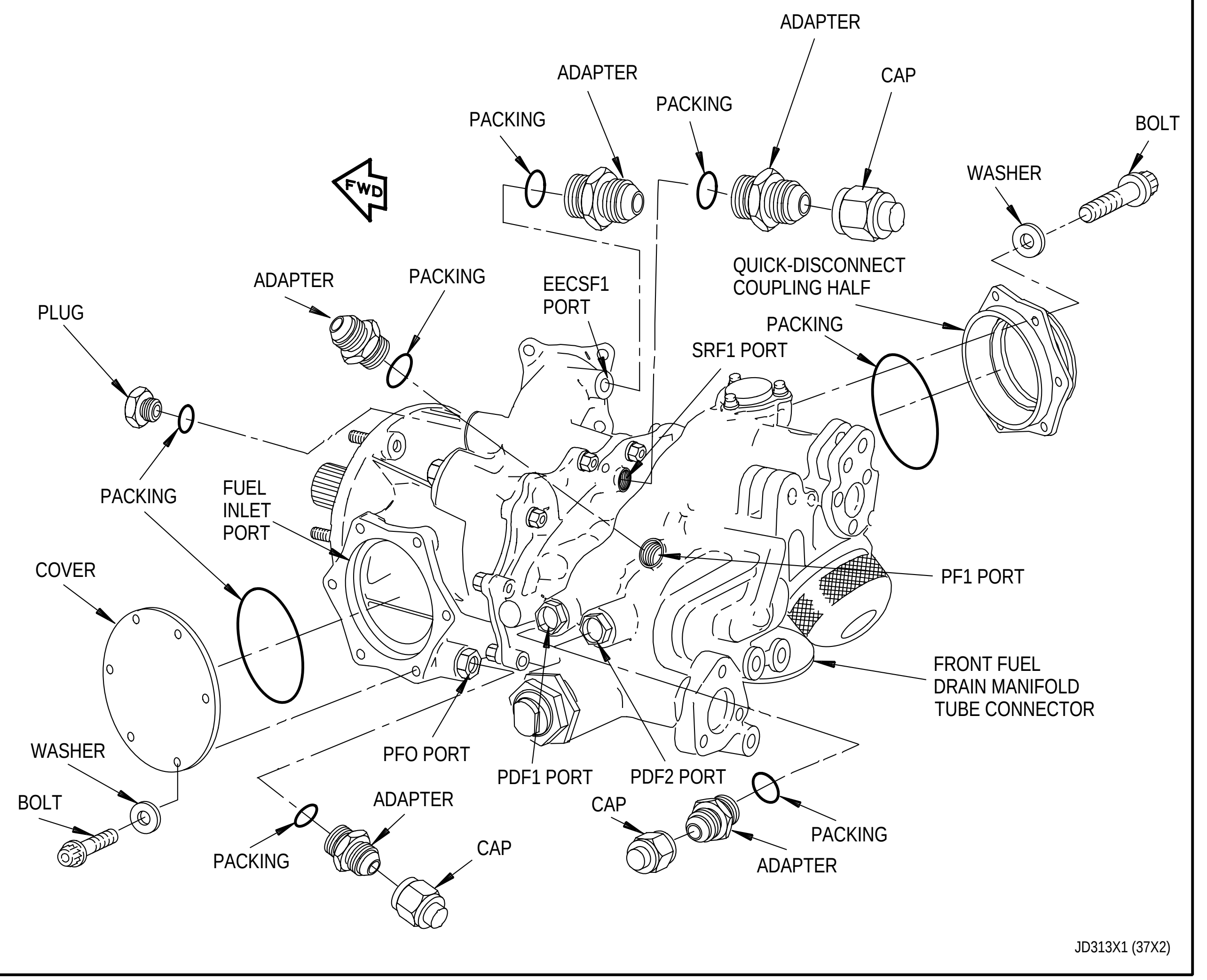


Figure 2. Main Fuel Gear Pump - Removal of Attaching Parts

6. MAIN FUEL GEAR PUMP - HELICAL COIL INSERTS REPLACEMENT.
(See Figure 3 and Table 1.)

a. Replace fuel gear pump helical coil inserts as follows:

CAUTION

Do not allow metal chips or particles to contaminate gear pump.

(1) Cap all open ports with protective closures.

(2) Using scriber, pry last thread of insert into center of hole. Using pointed pliers, grasp thread and turn it slowly counterclockwise to back out insert.

(3) As an alternate to step (2), use an extracting tool to remove insert. Place tool blade in hole about a quarter-turn from end of insert. Strike head of tool lightly with hammer to dig blade into top coil of insert. Bear down hard on tool handle while turning it slowly counterclockwise to back out insert.

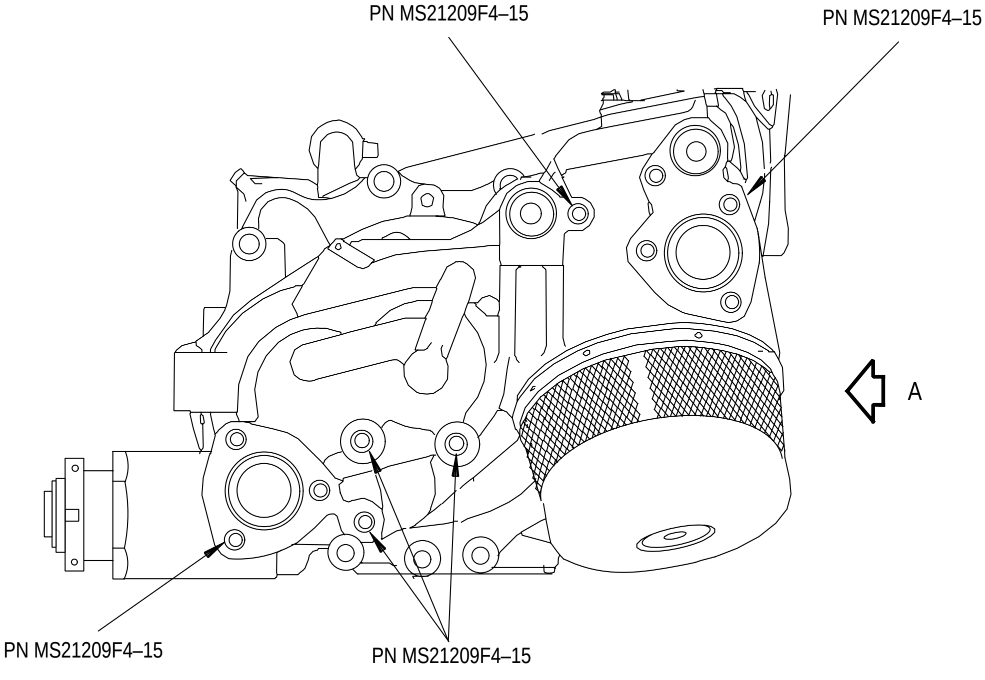
(4) Use tap to smooth out nicks and burrs in tapped hole. Clean hole with compressed air.

(5) Paint new insert with zinc chromate primer. Refer to T.O. 2J-F100-53-1, SWP 097 10.

(6) Using installation tool, install insert into tapped hole to a depth of 1 to 1 1/2 pitches below top surface. Remove drive tang using tang breakoff tool.

Table 1. Main Fuel Gear Pump Helical Coil Insert Sizes

Part Number	Insert Size	Minimum Thread Depth (Inch)
MS21209F4-15	0.250-28UNF-3B	0.357
MS21209F4-20	0.250-28UNF-3B	0.482



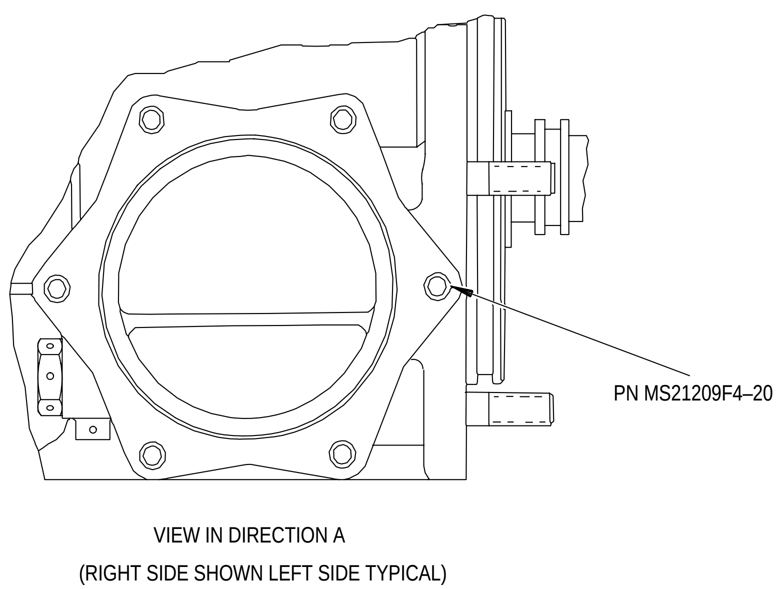


Figure 3. Main Fuel Gear Pump Helical Insert - Replacement

7. MAIN FUEL GEAR PUMP - FILTER ASSEMBLY INSPECTION.
(See Figure 4.)

a. Remove main fuel gear pump filter assembly. Refer to paragraph 8.

b. Inspect fuel filter cover for cracks or distortion. If damaged, replace cover.

c. Inspect external threads of fuel filter cover and internal threads of gear pump housing. Look for stripped or crossed threads and galled areas. If pump housing threads are worn, blend threads. If filter cover threads are worn, replace cover.

d. Inspect packing groove for wear and foreign material build-up. If damaged, replace cover.

e. Check differential pressure indicator. If extended, reset differential pressure indicator button by inverting fuel filter cover and pressing button. If indicator button fails to reset, replace indicator per paragraph 8.

f. Inspect pump anti-drain valve for leakage. A slight wetting or appearance of a few drops of fuel is acceptable. If leakage is evident, replace gear pump.

g. Back flush fuel filter element and inspect for metal chips or slivers using magnet. If metal particles are found, perform fuel system contamination inspection. Refer to T.O. 2J-F100-53-2, WP 015 00.

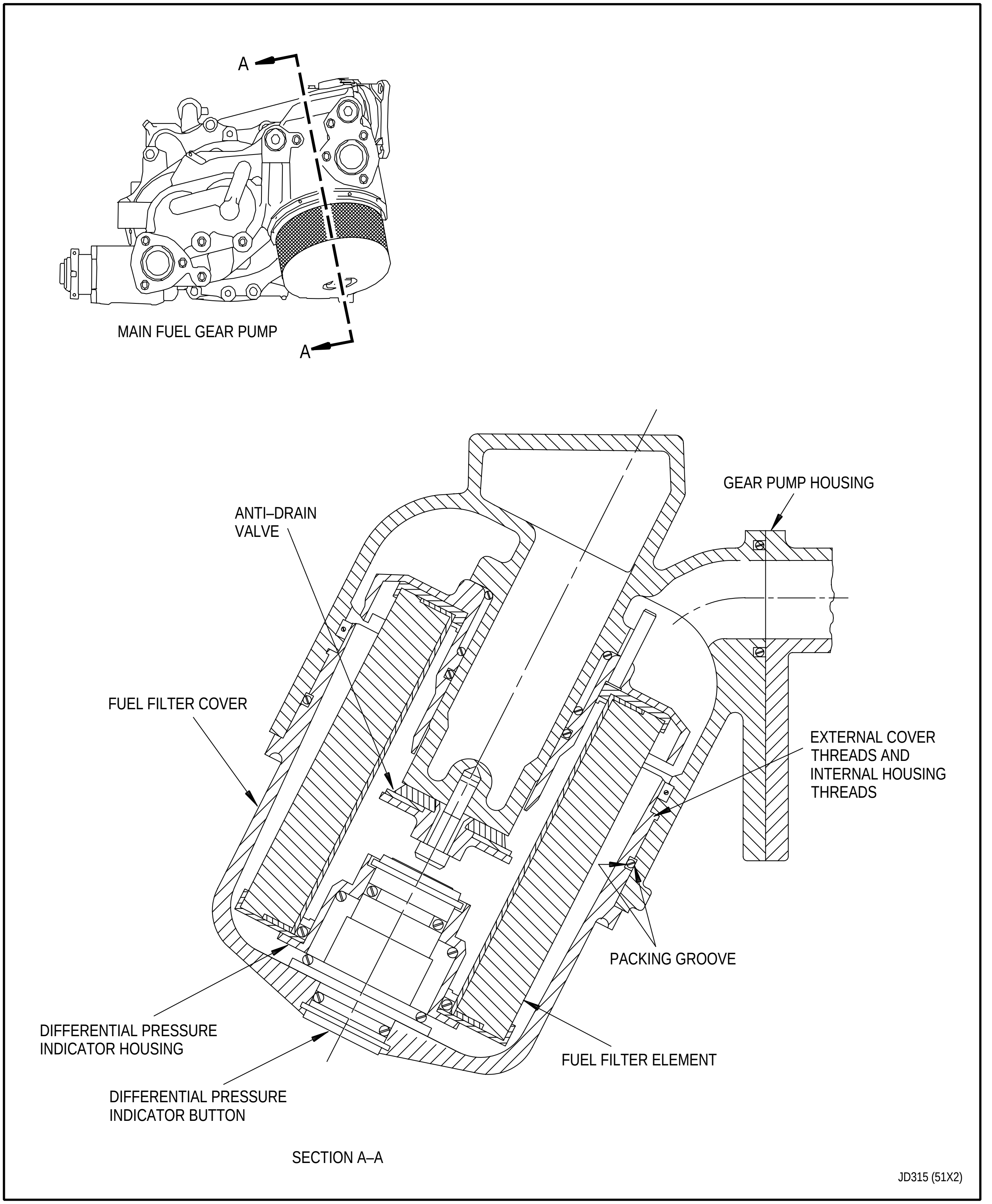


Figure 4. Main Fuel Gear Pump Filter - Inspection

8. MAIN FUEL GEAR PUMP - FUEL FILTER ELEMENT AND DIFFERENTIAL PRESSURE INDICATOR REPLACEMENT.
(See Figure 5.)

NOTE

- A differential pressure indicator button, mounted in filter cover, pops out when fuel filter pressure has a drop of approximately 17 ±2 psid. A popped button indicates that filter element is clogged.
- Gear pump anti-drain valve should close before filter cover is completely removed from pump housing. If valve fails to close, replace gear pump.

a. Remove fuel filter element from gear pump housing as follows:

NOTE

Always attempt to remove filter cover by hand before using strap wrench.

(1) Remove fuel filter cover with filter element from pump housing. (See figure 5, Sheet 1.) If filter element hangs up in pump housing, loosen by light tapping with rubber mallet. If filter cover cannot be removed by hand, use Lisle strap wrench PN 63500, or equivalent, to loosen it.

(2) Remove filter element from filter cover. (See figure 5, Sheet 2.)

(3) Remove packing from outer groove of filter cover. Discard packing.

(4) Flush filter cavity in pump housing and inside of filter cover with P-D-680, Type II petroleum solvent.

(5) Visually inspect gear pump filter assembly. Refer to paragraph 7.

(6) Check differential pressure indicator by turning filter cover bottom side up and pressing differential pressure button in to reset. If button fails to reset, replace differential pressure indicator.

b. If required, install new differential pressure indicator as follows:

(1) Remove retaining ring from exterior of filter cover and remove pressure indicator assembly from inside fuel filter cover.

(2) Remove retaining ring from end of differential pressure housing and disassemble differential pressure indicator, differential pressure housing, and filter preload compression spring. Remove and discard packings.

(3) Lubricate new packings with lubricating oil and install into packing grooves of differential indicator.

(4) Install filter preload compression spring and differential pressure indicator into differential pressure housing, using suitable means. Secure differential pressure indicator with retaining ring.

(5) Install differential pressure indicator and housing assembly into fuel filter cover and secure with second retaining ring.

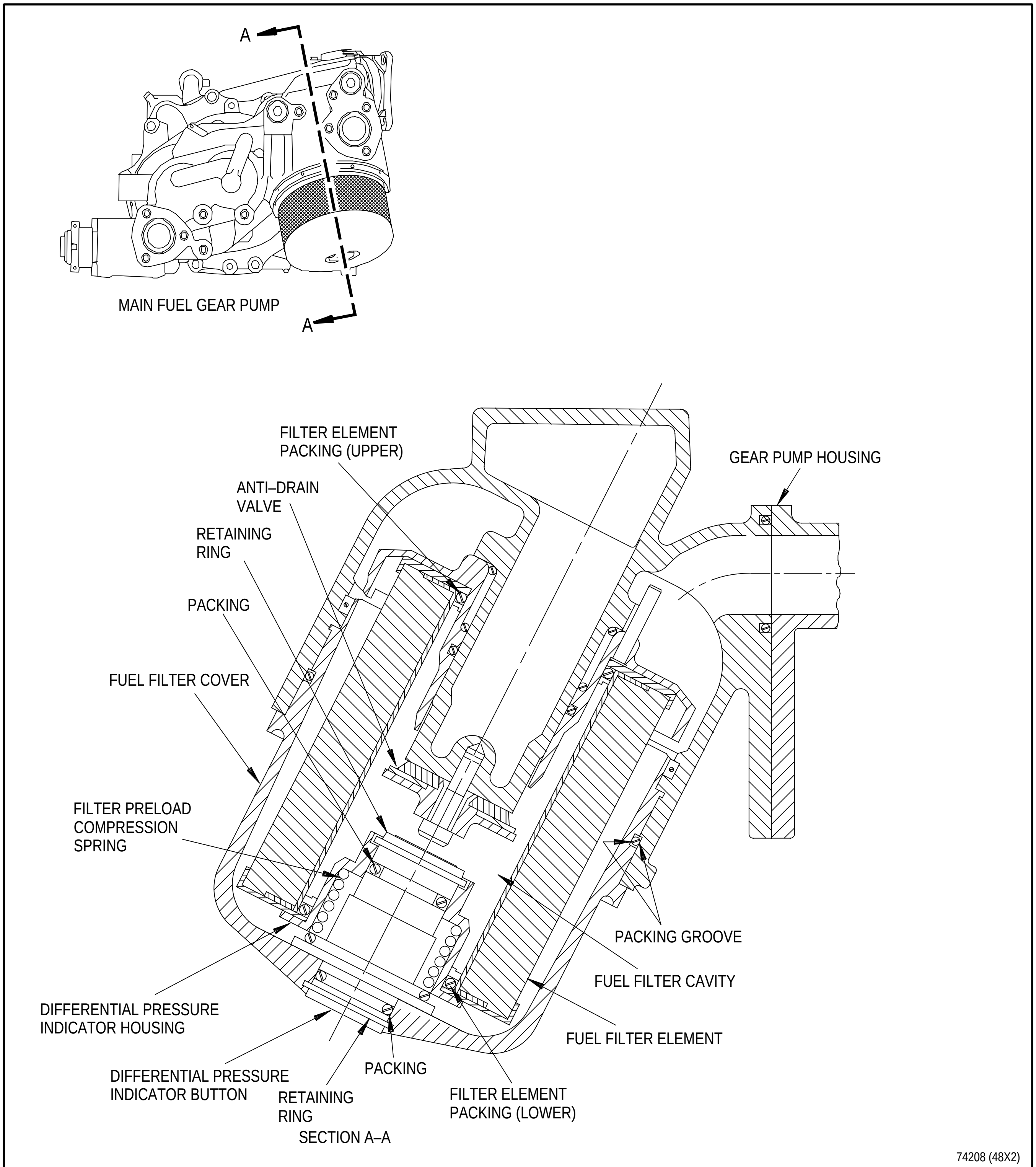


Figure 5. Main Fuel Gear Pump Fuel Filter Element and Differential Pressure Indicator - Replacement (Sheet 1 of 2)

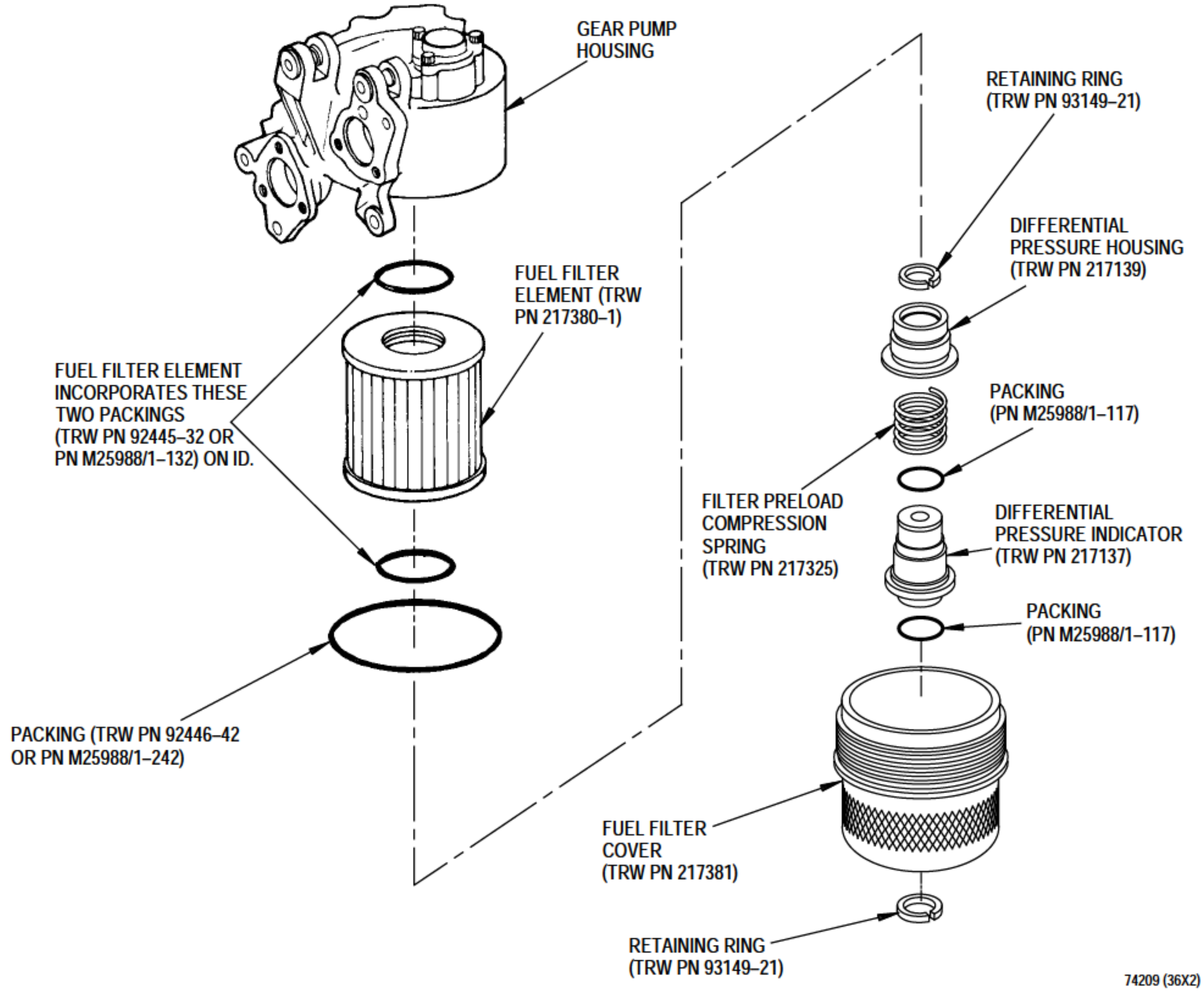


Figure 5. Main Fuel Gear Pump Fuel Filter Element and Differential Pressure Indicator- Replacement (Sheet 2 of 2)

c. Install new fuel filter element in gear pump housing as follows:

(1) Coat packing with MIL-L-7808 oil or VV-P-236 petrolatum.

(2) Install packing in outer groove of filter cover. Ensure packing is in groove straight and evenly stretched around groove circumference.

(3) Turn fuel filter cover bottom side up and press differential pressure button in to reset.

(4) Check for packings in ID at both ends of filter element.

(5) Install filter element in cover and center it to assure alignment with antidrain valve in pump housing.

(6) Install filter cover in pump housing, tighten cover until flange contacts housing. Lockwire cover to housing using PN MS9226-04 lockwire.

9. MAIN FUEL GEAR PUMP - INSTALLATION OF ATTACHING PARTS.
(See Figure 6.)

a. Lubricate packings with a light coat of MIL-L-7808 or VV-P-236 petrolatum. (See figure 6.) Install packings on attaching parts.

b. Lubricate threads of adapters with MIL-L-7808 oil.

c. Install adapters, caps, and plugs to gear pump and torque.

d. Lubricate threads of bolts securing cover to main fuel gear pump with PWA 550 antigalling compound.

e. Install cover and torque bolts.

f. Lubricate threads of bolts securing quick-disconnect coupling half to pump with MIL-L-7808 oil.

g. Install quick-disconnect coupling half to pump assembly and torque bolts.

10. MAIN FUEL GEAR PUMP - INSTALLATION.
(See Figure 7.)

a. Apply PWA 550 antigalling compound to studs and bolts. (See figure 7, Sheet 1.)

b. Lubricate gear pump splines with VV-P-236 petrolatum.

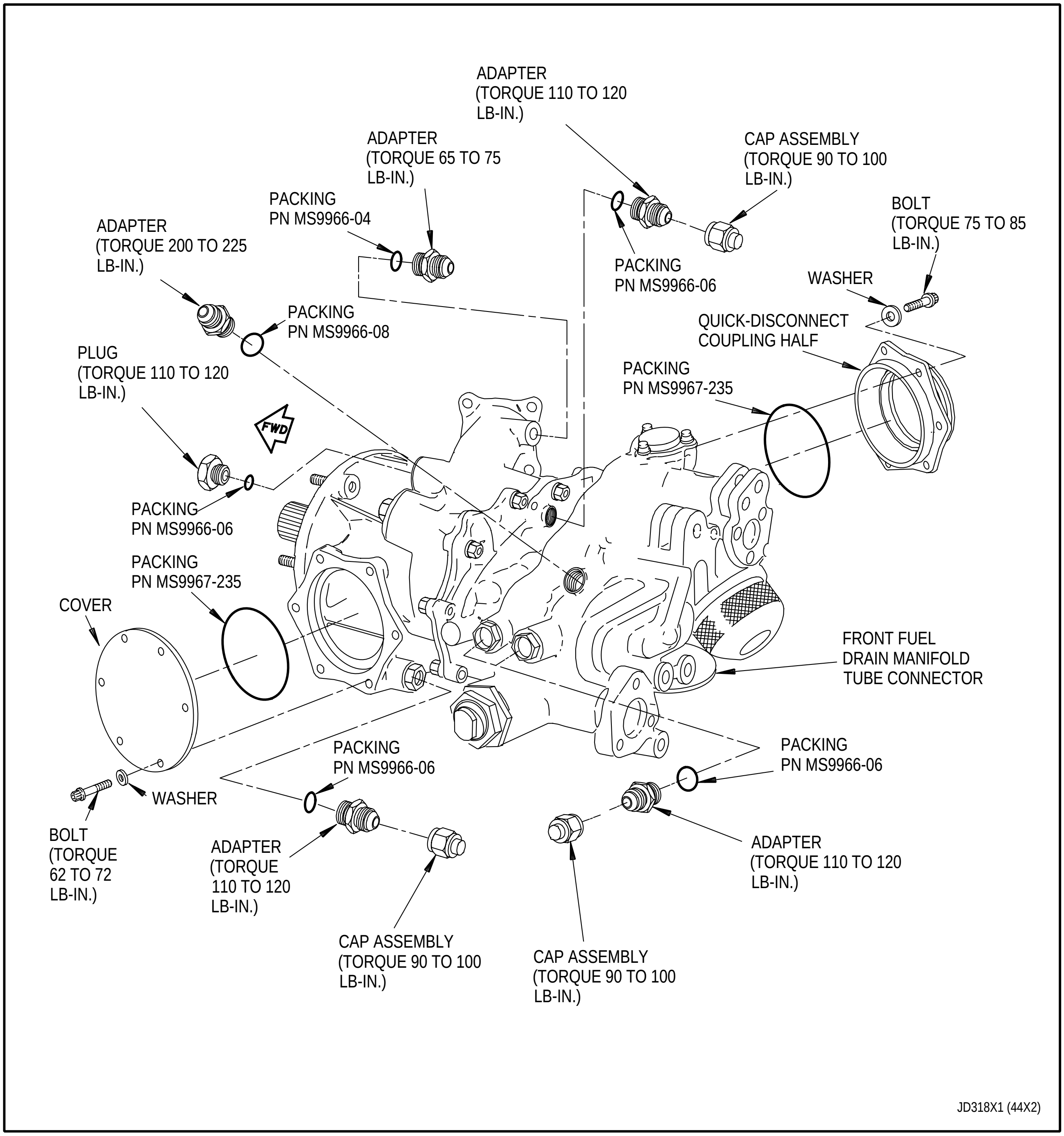


Figure 6. Main Fuel Gear Pump - Installation of Attaching Parts

c. Lubricate packings with MIL-L-7808 oil.

d. Install new lubricated packings. (See figure 7.)

CAUTION

- Do not move pump rearward once driveshaft packing engages reduction gearbox.
- To prevent spline damage, pump shall be supported on horizontal plane with gearbox during installation.

NOTE

- For ease of assembly, pivot link assemblies clear of mounts.
- Spline may be aligned by rotating gearbox drive spur bevel gearshaft in front face of gearbox.
- Looseness or partial disengagement of clevis mount bushing (see figure 7) is an acceptable condition and MFGP can be considered serviceable. If bushing has completely disengaged from clevis mount, pump must be removed and returned to depot for repair.
- Once MFGP has been properly seated on engine with all attaching bolts torqued correctly, there should be no discernable movement of MFGP at clevis mount.

e. Install pump on reduction gearbox, aligning splines of pump and gearbox. Mate augmentor fuel pump PF1 tube elbow with pump.

f. Position link assemblies and install pins, retaining linkage, and bolts. Torque bolts. (See figure 7, Sheet 1.)

g. Install main fuel gear pump to reduction gearbox. Secure using nuts and washers. Install bracket using nuts only. Torque nuts 290 to 325 pound-inches.

NOTE

To prevent false readings, check main fuel gear pump alignment by inserting the gage radially adjacent to the studs and not midway between the studs. This will insure that the gage does not protrude into the pry off slots that are machined into the main housing midway between the studs.

h. Check alignment points by attempting to insert 0.005 inch feeler gage between pump and reduction gearbox mounting flanges at five accessible locations between 3 o’clock and 9 o’clock positions. Ensure gage is parallel with pump and gearbox mating flanges and insert gage as far as it will go. If gage cannot be inserted more than 0.250 inch between flanges, proceed to next step. If gage can be inserted further than 0.250 inch, remove pump and determine reason for misalignment. Install pump, and repeat this check.

i. Install bolts and nuts to secure augmentor fuel pump PF1 tube elbow to main fuel gear pump. Torque nuts. (See figure 7, Sheet 2.)

j. Install remaining tubes and torque. (See figure 7, Sheet 2.)

k. Apply a light coat of PWA 550 antigalling compound to bolts. (See figure 7, Sheet 3.) Wipe off excess.

l. Lubricate packing with MIL-L-7808 oil or VV-P-236 petrolatum. Wipe off excess and install on tube elbow.

m. Install tube elbow on main fuel pump and secure with bolts. Torque bolts.

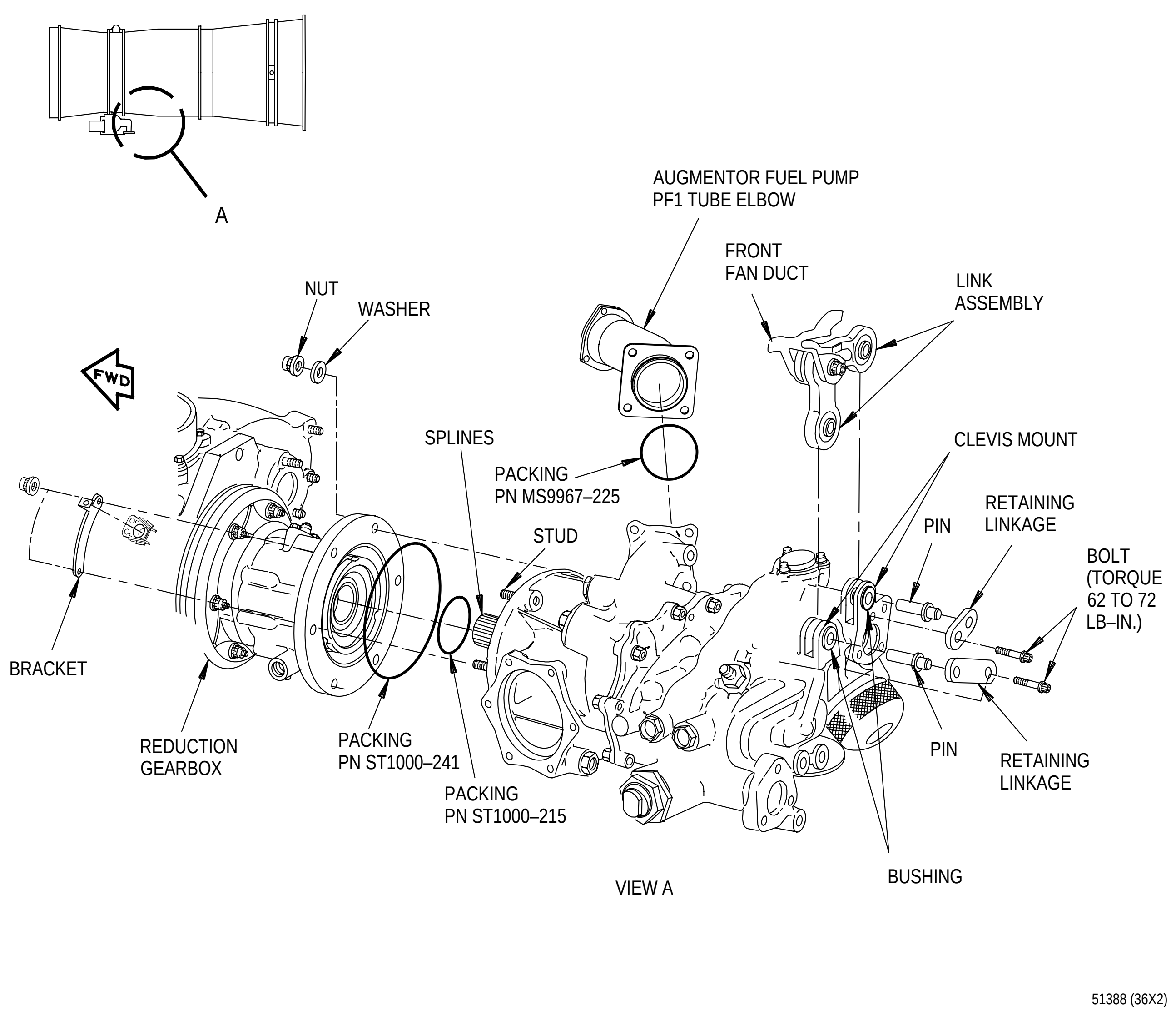


Figure 7. Main Fuel Gear Pump - Installation (Sheet 1 of 3)

n. Lubricate gaskets with MIL-L-7808 lubricating oil.

o. Install gaskets no tube elbow and main fuel control tube connector. Connect tube nuts fingertight. Install loop clamp bolt and nut.(See figure 7, Sheet 3.)

p. Torque tube nuts. Tighten loop clamp nut.

q. Position hose assembly (PF2) on main fuel gear pump. Install bracket and bolts. Torque bolts. (See figure 7, Sheet 3.)

r. Connect hinged cushioned loop clamp to secure white cable and T_{t2} probe capillary tube.

s. Connect tube and hoses to front fuel drain manifold tube connector.

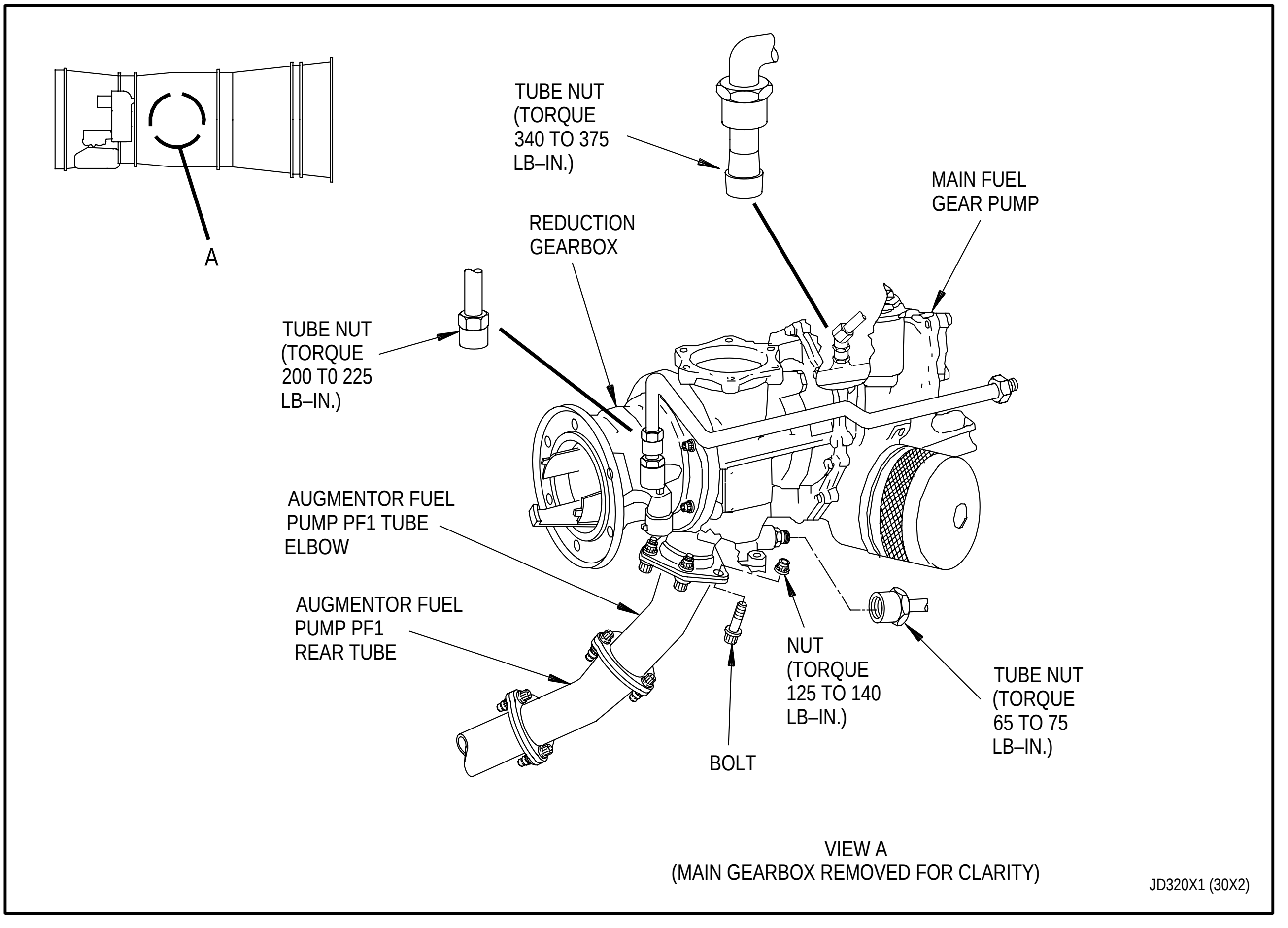


Figure 7. Main Fuel Gear Pump - Installation (Sheet 2 of 3)

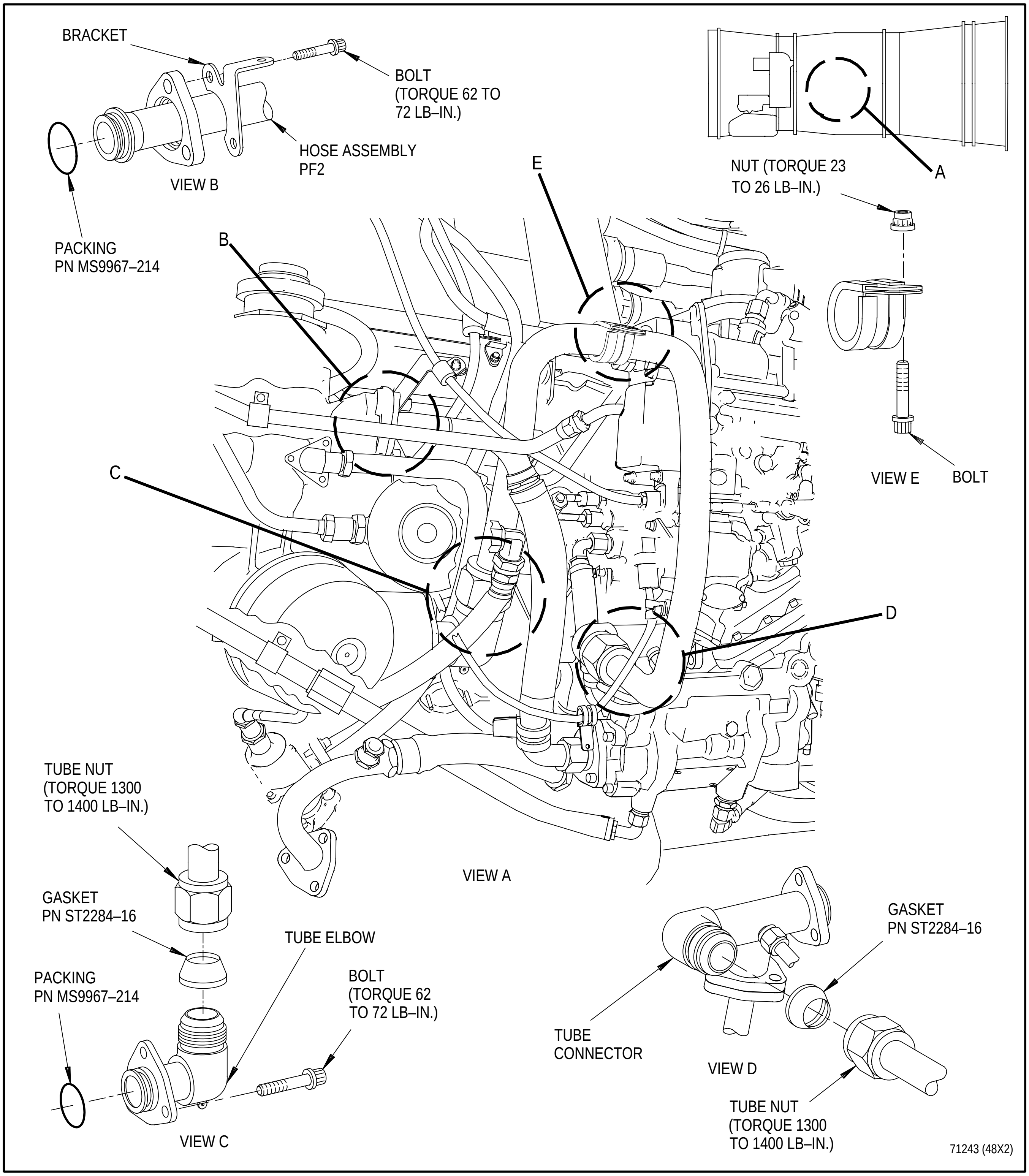


Figure 7. Main Fuel Gear Pump - Installation (Sheet 3 of 3)

11. MAIN FUEL PUMP - STORAGE AND SHIPMENT.

CAUTION

Perform the following instructions prior to storing and shipping main fuel pump to avoid accessory contamination or damage.

a. Drain all residual fuel or oil from fittings and ports.

b. Remove attaching parts. Refer to paragraph 4.

c. Cover all open ports and fittings securely using protective closures.

CAUTION

Do not water wash or dip accessory in solvent as this procedure can cause severe internal corrosion damage.

d. If exterior of unit requires cleaning, wipe with clean cloth moistened with P-D-680, Type II petroleum solvent and dry with clean, dry lint-free cloth.

e. Pack fuel pump in shipping container, ensuring unit is securely mounted on mounting pad provided. If no mounting provisions are available, ensure unit is thoroughly cushioned with shock absorbent packing material.

WORK PACKAGE

TECHNICAL PROCEDURES

COUPLING HALF - QUICK-DISCONNECT, RATCHET LOCK

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 6

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 5	0				
6 Blank	0				

REFERENCE MATERIAL REQUIRED

None

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Cloth, dry lint-free	-
Compound, antigalling (PWA 550)	Hi-T 650 or Lubri-Bond HT
Oil, lubricating or	MIL-L-7808
Petrolatum	VV-P-236
Solvent, petroleum	P-D-680, Type II

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Cover	99014	1
Packing, preformed	MS9967-235	1

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures on the quick-disconnect ratchet lock coupling half:

- Removal
- Cleaning
- Inspection
- Installation

2. QUICK-DISCONNECT RATCHET LOCK COUPLING HALF - REMOVAL.

(See Figure 1.)

a. Remove bolts and washers holding quick-disconnect ratchet lock coupling half to mounting pad of fuel pump. Remove coupling half. (See figure 1.)

b. Remove packing from ring groove of fuel pump mounting pad. Discard packing.

c. Install PN 99014 cover over mounting pad of fuel pump .

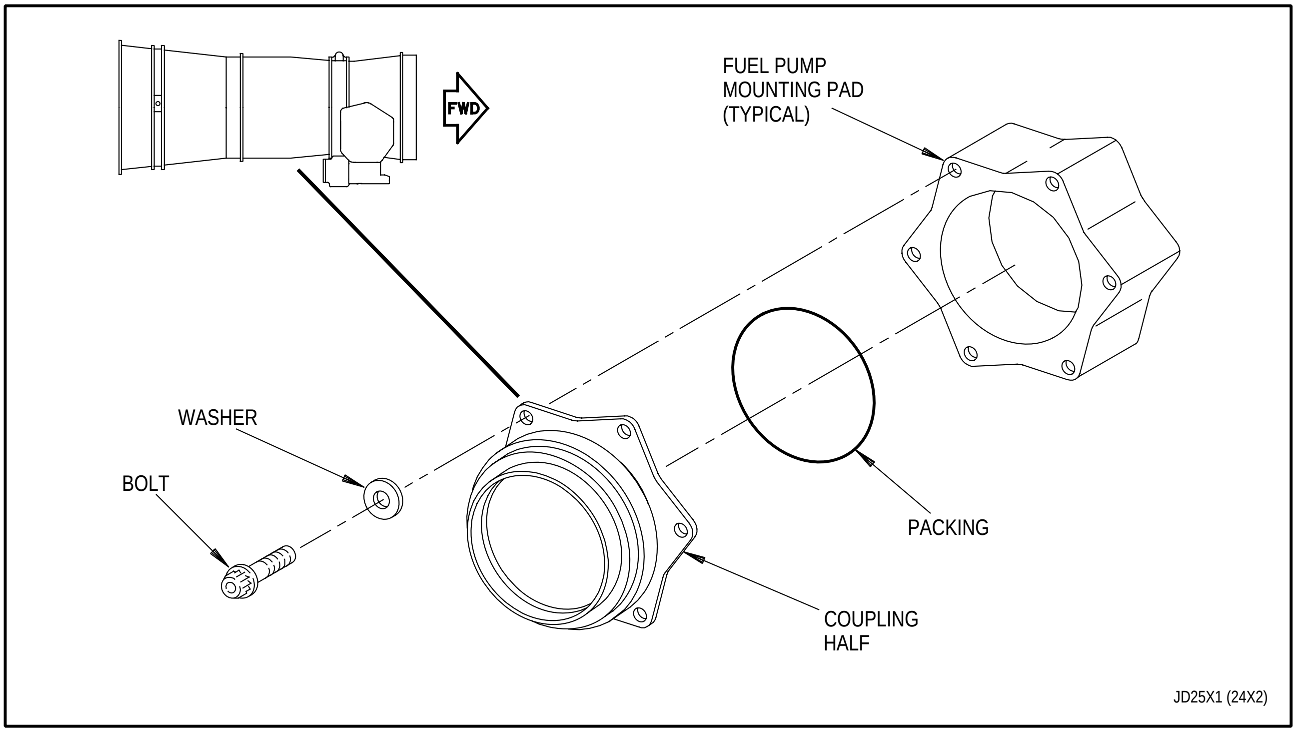


Figure 1. Quick-disconnect Ratchet Lock Coupling Half - Removal

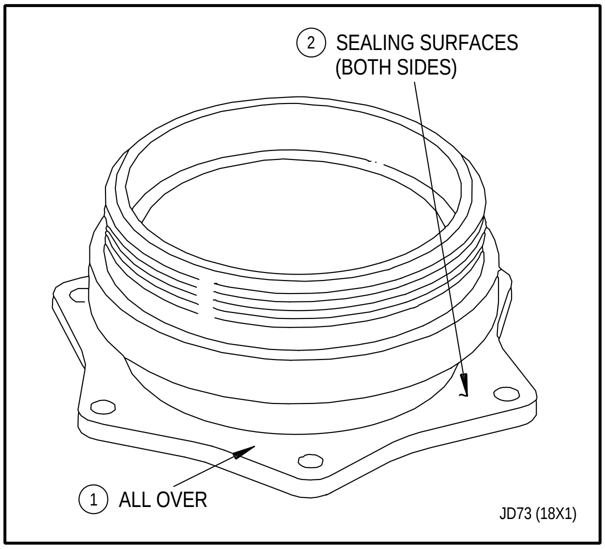
3. QUICK-DISCONNECT RATCHET LOCK COUPLING HALF - CLEANING.

a. Using a clean cloth moistened with P-D-680, Type II petroleum solvent, wipe exterior of coupling half.

b. Dry coupling half with a clean, dry lint-free cloth.

4. QUICK-DISCONNECT RATCHET LOCK COUPLING HALF - INSPECTION.
(See Figure 2.)

a. Inspect coupling half. (See figure 2.)



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. All over -			
Cracks	Not serviceable	Not reparable	Replace coupling half.
2. Sealing surfaces -			
Pitting or imperfections	Not serviceable	Not reparable	Replace coupling half.

Figure 2. Quick-disconnect Ratchet Lock Coupling Half - Inspection

5. QUICK-DISCONNECT RATCHET LOCK COUPLING HALF - INSTALLATION.
(See Figure 3.)

a. Remove protective closure from mounting pad of fuel pump. (See

b. Lubricate PN MS9967-235 packing with a light coat of MIL-L-7808 oil or VV-P-236 petrolatum.

c. Install packing in ring groove of fuel pump mounting pad.

d. Apply a light coat of PWA 550 antigalling compound on threads of coupling half mounting bolts.

e. Place coupling half on fuel pump mounting pad and install bolts and washers. Torque bolts 75 to 85 pound-inches.

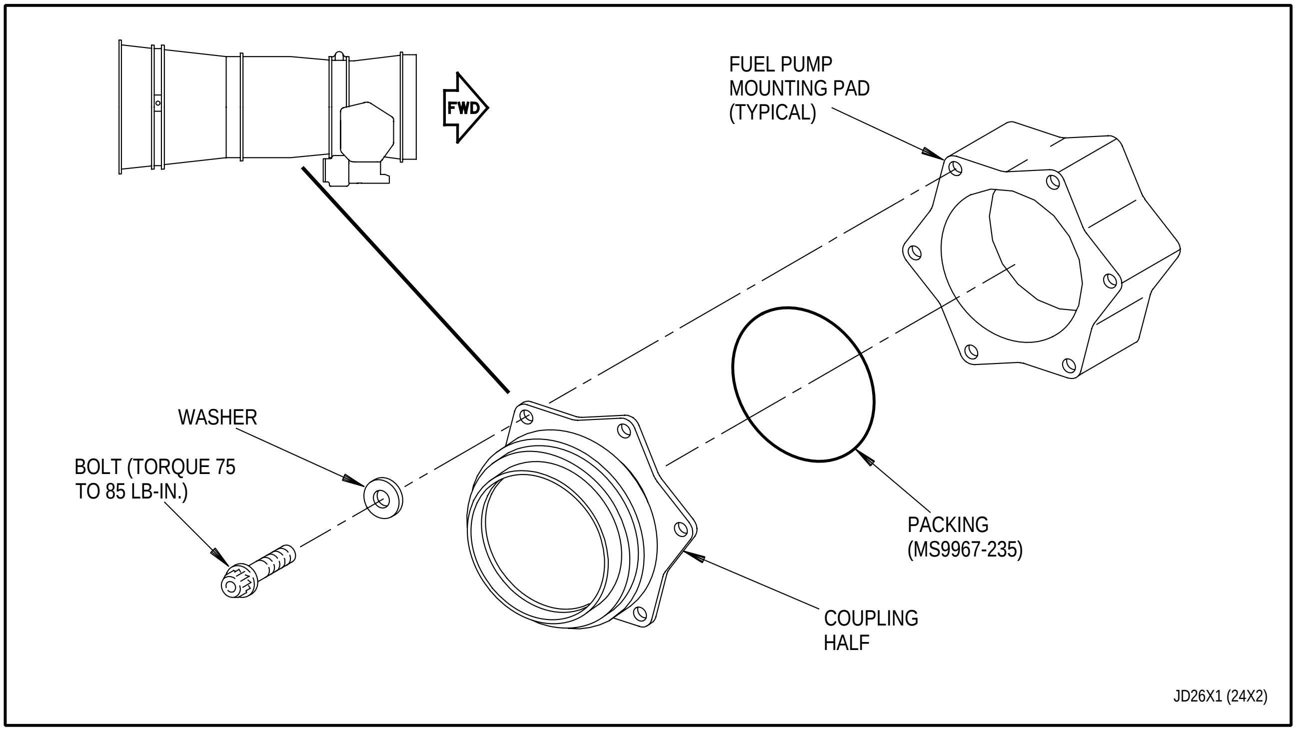


Figure 3. Quick-disconnect Ratchet Lock Coupling Half - Installation

WORK PACKAGE

TECHNICAL PROCEDURES

CONTROL - ENGINE, DIGITAL ELECTRONIC

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 18

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	8	4 - 14	7	17 Added	8
2	7	15 - 16	8	18 Blank Added	8
3	8				

REFERENCE MATERIAL REQUIRED

Title	Number
Standard Maintenance Procedures	T.O. 2-1-111
Introduction and General Information	T.O. 2J-F100-53-1
General Procedures	WP 021 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

T. O. No.	Date	Level	Title (ECP No.)
T.O. 6J3-4-117-504	30 June 91	O/I	Upgrade of PN 496521H01D01 Digital Electronic Engine Control to 2.5.0 logic-F100-PW-229 engine.

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Alcohol, denatured or	O-E-760, Type II
Trichloroethane inhibited-1, 1, 1	0-T-620
Alcohol, isopropyl	TT-I-735
Cloth, dry lint-free	-
Compound, antigalling (PWA 550)	Hi-T-650 or Lubri-Bond HT
Compound, retaining (PWA 549)	Loctite 640, Type II
Compound, sealing	Dow Corning No. 4 (DC4)
Film, polyethylene	0.006 inch thick
Grease, lubricating	Aero lubriplate Fisk Brothers Refining Co.
Lockwire (0.032 inch diameter)	MS9226-04
Methyl Ethyl Keytone (PMC 1820)	Reaaent Grade Fisher Scientific Co.
Methyl Ethyl Keytone (PMC 9076)	TT-M-261
Oil, lubricating or	MIL-L-7808
Petrolatum	VV-P-236
Primer, quick	MIL-S-22473, Grade T, or Locquic Primer T 74771
Solvent, petroleum	P-D-680, Type II
Tape, masking, moisture resistant	PPP-T-60, Type III, Class I

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Packing, preformed	M25988-1-019	1
Packing, preformed	MS9966-04	1
Packing, preformed	MS9966-05	1
Packing, preformed	MS9966-05	4

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
8	Digital Electronic Engine Control - Installation	
	Vacuum Tester Set ----------------------	PWA 57796

ILLUSTRATED SUPPORT EQUIPMENT

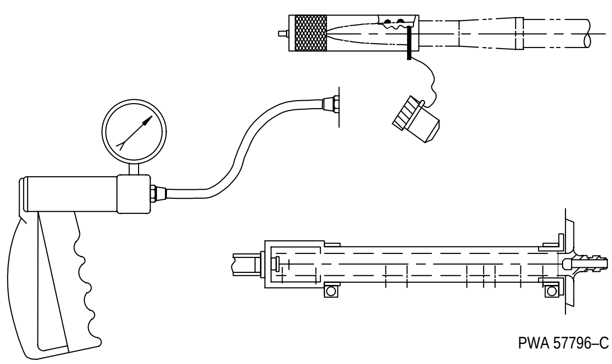


Figure T1. PWA 57796 Vacuum Tester Set

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures on the digital electronic engine control (DEEC):

- Removal
- Purging and removal of attaching parts
- Cleaning
- Inspection
- Pressure relief valve - Replacement
- Installation of attaching parts
- Installation
- Storage and shipment

2. DIGITAL ELECTRONIC ENGINE CONTROL - REMOVAL.

(See Figure 1.)

a. Remove electrical cable connectors P81, P82, P83, P84, P85, P87, and P88 as required from DEEC. (See figure 1.) Install protective closures on control electrical receptacles and cable connectors.

CAUTION

Do not introduce water, oil, fuel, etc, into DEEC P2, P3 (Pb), or P6 pressure transducer ports. If contaminated, DEEC vibrating cylinder pressure transducers are unserviceable.

b. Disconnect DEEC fuel coolant inlet and return manifolds, P2 manifold, P3 and P6 tubes from control. Install protective closures on port adapters.

c. Remove control from engine as follows: (See figure 1.)

(1) Disconnect nut, bolt, and washer that attach electrical lead to ground lug of control.

(2) Support control, and remove bolt and washer at four support locations. Remove control from mount supports.

d. Remove protective closures from fuel port adapters of control. Drain any residual fuel from control into container. Install closures back onto adapters.

CAUTION

Severe internal corrosion damage can result from exposure of DEEC to the elements.

e. If unit is to be stored or shipped, follow packaging directions in paragraph 9.

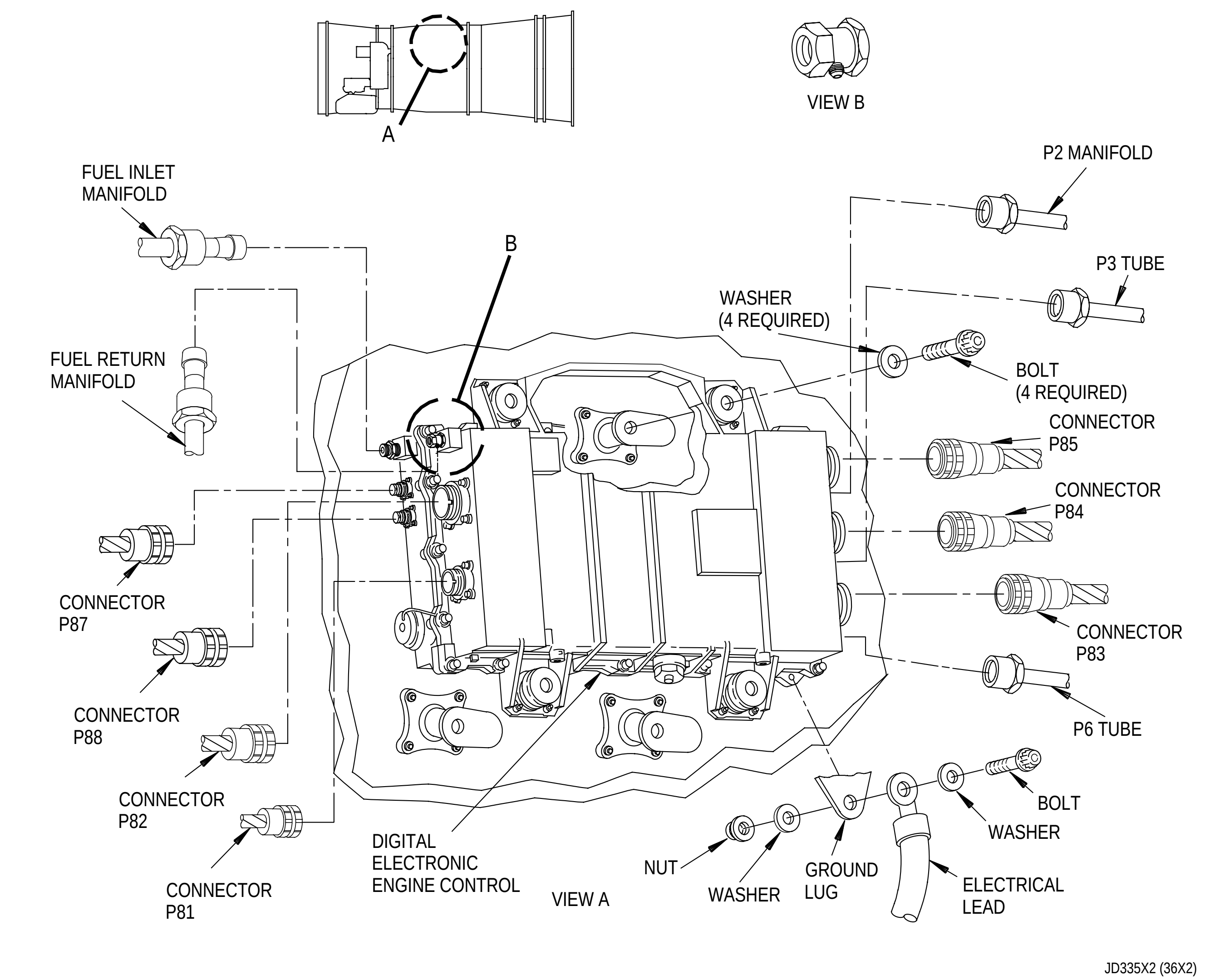


Figure 1. Digital Electronic Engine Control - Removal

3. DIGITAL ELECTRONIC ENGINE CONTROL - PURGING AND REMOVAL OF ATTACHING PARTS.
(See Figure 2.)

CAUTION

The DEEC shall only be opened by authorized personnel at a certified Electrostatic Discharge Sensitive (ESDS) work station, or damage may occur to internal electronic components.

a. Remove protective closures from port adapters of control. (See figure 2.)

b. Apply dry, filtered air or nitrogen, at 25 to 30 psig maximum, to fuel-in port. Collect residual fuel in a container. Purge for approximately 3 minutes.

c. Remove adapters and packings from fuel in ports P2, P3, and P6. Discard packings.

d. Remove nut, connector, bolt (fluid passage), and packings from fuel out port.

e. Install protective plugs in port openings.

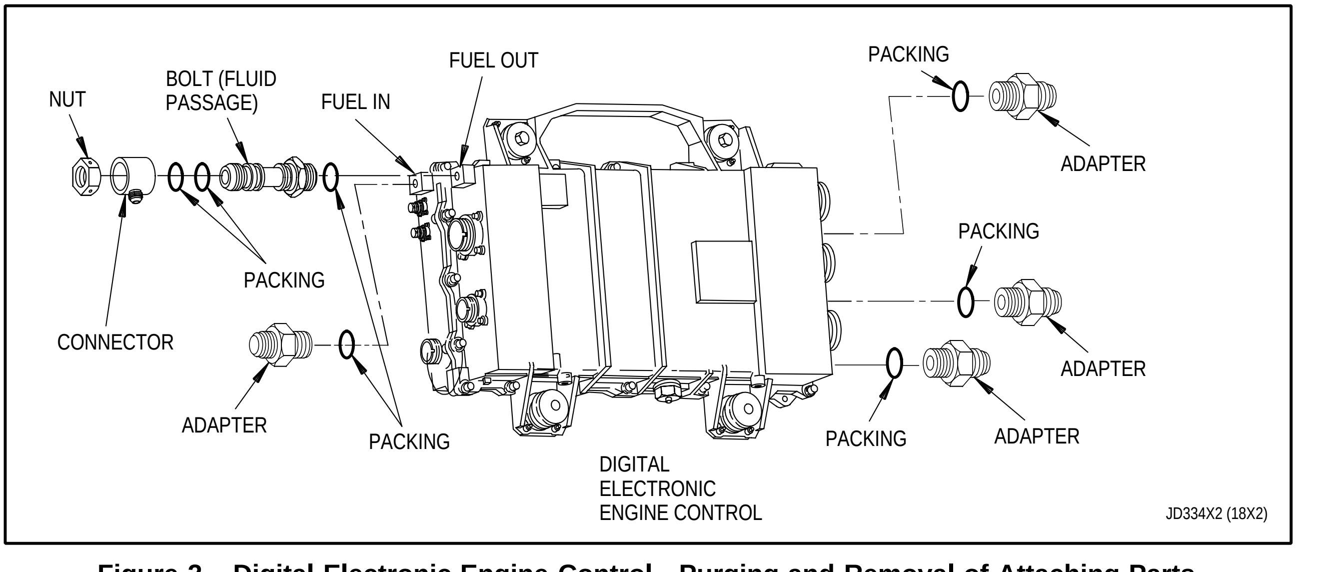


Figure 2. Digital Electronic Engine Control - Purging and Removal of Attaching Parts

4. DIGITAL ELECTRONIC ENGINE CONTROL - CLEANING.

a. Moisten a clean cloth with P-D-680, Type II petroleum solvent.

b. Wipe exterior of control with moistened cloth. Dry control with a clean, dry, lint-free cloth.

c. Remove protective closures from electrical connectors. Clean connector pins, sockets, and cable insulation with O-E-760, Type II alcohol or O-T-620 Trichloroethane inhibited-1,1,1. Dry connectors with clean, compressed air at less than 30 psig. Replace protective closures.

d. Clean ground lug faces and bolt hole where ground cable will be connected with P-D-680, Type II petroleum solvent.

e. Clean ring connectors of ground cable with P-D-680, Type II petroleum solvent.

5. DIGITAL ELECTRONIC ENGINE CONTROL - INSPECTION.

a. Remove protective closures from fuel ports of DEEC. Inspect fuel connections for damaged threads and signs of leakage. Replace control if threads are damaged. Replace protective closures.

b. Inspect electrical connectors. Refer to T.O. 2J-F100-53-1, WP 021 00. Replace control if damage exceeds reparable limits.

c. Inspect control housing and cover for damage. Deep gouges or cracks are cause for rejection.

d. Inspect ground cable for damage and security of ring connectors. Up to 50% of cable strands may be broken in one spot.

e. Inspect bolts and nuts used to mount control to supports, for wear or thread damage. Replace bolts and nuts that are damaged.

f. Inspect pressure relief valve for cracked or missing water guard cap, missing spring clip, and insecure mounting. Replace valve as necessary.

6. DIGITAL ELECTRONIC ENGINE CONTROL, PRESSURE RELIEF VALVE - REPLACEMENT.

(See Figure 3.)

CAUTION

Contamination of DEEC will make it unserviceable. Be extremely careful to avoid contamination by metallic chips, packing slivers, or external sources.

a. Remove pressure relief valve(1, figure 3) from control housing(2) as follows:

(1) Remove pressure relief valve(1) from control housing(2).

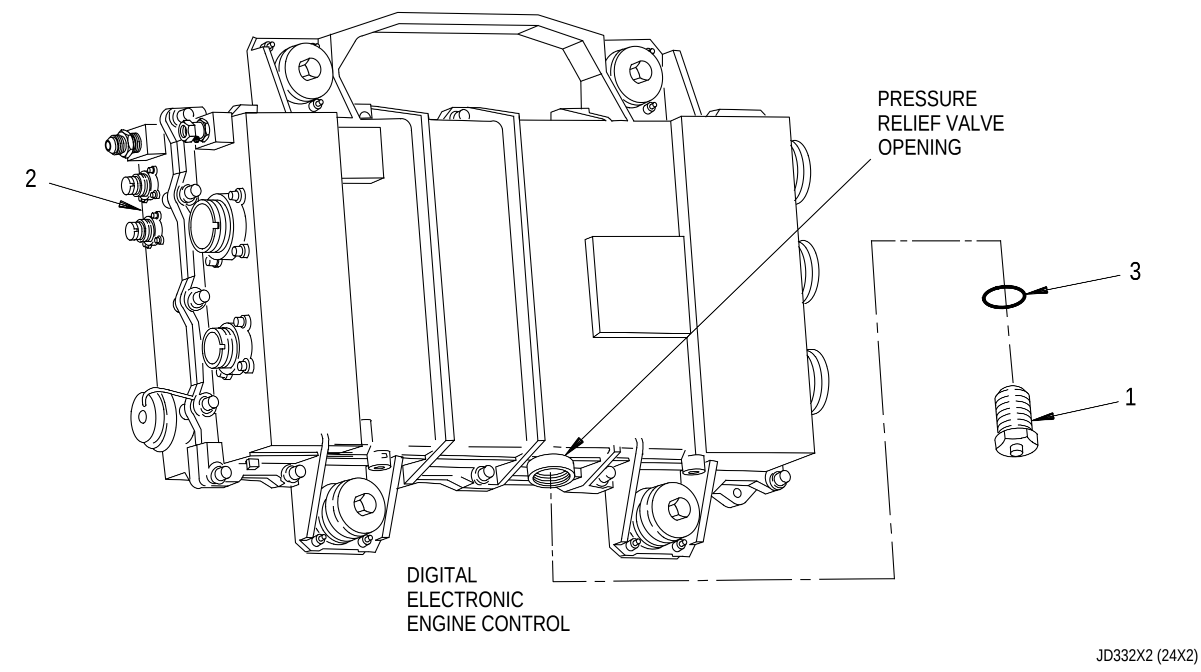
(2) Remove packing(3) from valve. Discard packing.

b. Install pressure relief valve(1) in control housing(2) as follows:

(1) Clean metal surface of pressure relief valve(1) using a clean cloth moistened with isopropyl alcohol.

(2) Clean metal surface around pressure relief valve opening in control housing(2) using a clean cloth moistened with isopropyl alcohol.

(3) Apply sealing compound (DC4) on packing(3). Install packing on pressure relief valve(1).



1. PN ED746174-02 pressure relief valve
2. Control housing
3. PN M25988-1-019 packing

Figure 3. Digital Electronic Engine Control, Pressure Relief Valve - Replacement

(4) Apply a thin coating of primer T (Locquic) to threads of pressure relief valve(1).

(5) Apply PWA 549 retaining compound around threads of pressure relief valve(1).

(6) Install pressure relief valve(1). Torque 5 to 10 pound-inches.

7. DIGITAL ELECTRONIC ENGINE CONTROL - INSTALLATION OF ATTACHING PARTS.
(See Figure 4.)

a. Remove protective closures from fuel ports, P2, P3, and P6.

b. Lubricate packings with a light coat of MIL-L-7808 oil or VV-P-236 petrolatum.

CAUTION

Failure to remove excess lubricant can result in contamination of control pressure transducers.

c. Remove excess lubricant from packings.

CAUTION

To avoid DEEC pressure transducer contamination, do not lubricate or allow excess packing lubricant on adapter port threads or internal surfaces.

d. Install packings on adapters and install adapters in ports of control. Torque adapters. (See figure 4.)

e. Install packings on bolt (fluid passage) and install bolt in port marked FUEL OUT. Torque bolt. (See figure 4.)

f. Install connector on bolt (fluid passage). Secure with nut. Torque nut. (See figure 4.) Lockwire nut using MS9226-04 wire.

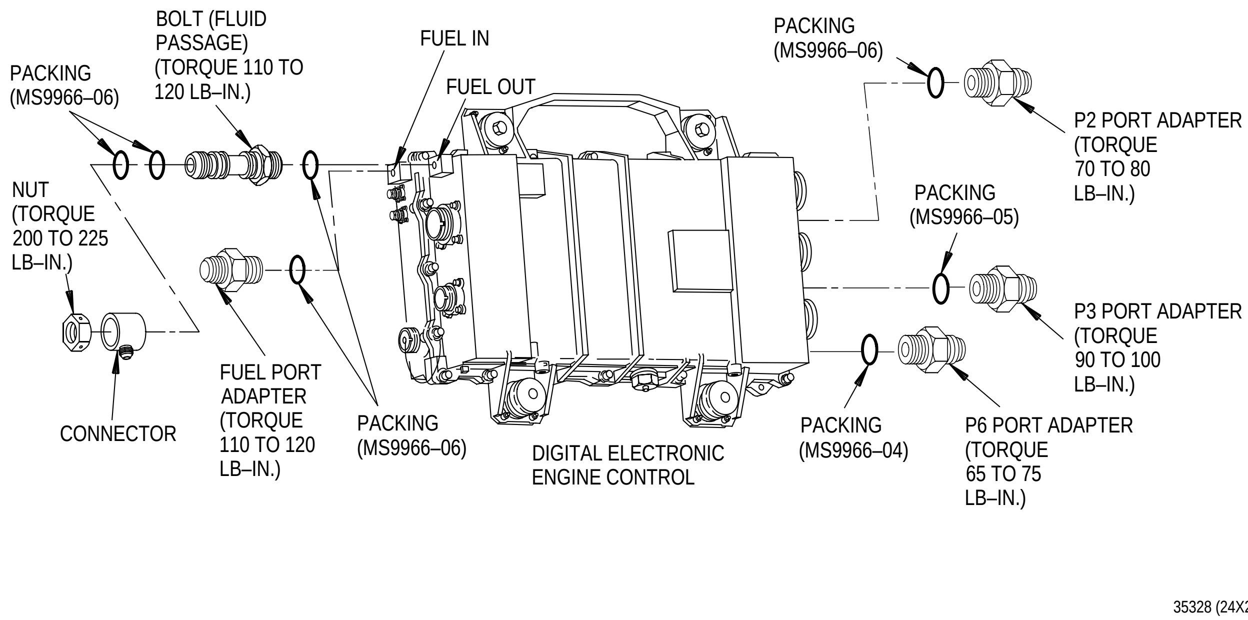


Figure 4. Digital Electronic Engine Control - Installation of Attaching Parts

8. DIGITAL ELECTRONIC ENGINE CONTROL - INSTALLATION.

(See Figure 5.)

a. If control is a replacement. Clean and inspect per paragraphs 4 and 5.

b. Install DEEC as follows: (See figure 5, sheet 1.)

CAUTION

Do not introduce water, oil, fuel, etc, into DEEC vibrating cylinders. If contaminated, vibrating cylinders are unserviceable.

(1) Clean around bolt hole of support that accommodates electrical lead with a clean cloth moistened with P-D-680, Type II petroleum solvent.

(2) Position control to supports on engine case.

NOTE

Apply PWA 550 antigalling compound only if old mount bolts are used in step (3).

(3) Apply PWA 550 antigalling compound to threads of four mounting bolts. Install bolts and washers at four support locations. Torque bolts 125 to 140 pound-inches.

(4) Connect electrical lead to ground lug with bolt, washers, and nut. Torque nut 27 to 30 pound-inches.

c. Remove protective closures from tube adapters on control. (See figure 5, sheet 2.)

NOTE

To avoid DEEC pressure transducer contamination, adapter connector threads PNs 4074598, 4074599, and 4074636 incorporate dry film PWA 550 antigalling compound.

d. Mask ends of tube adapters to prevent internal contamination and apply thin coat of PWA 550 antigalling compound to threads of tube adapters. Remove excess and comply with T.O. 2-1-111, PWA Spec 550 cure requirements prior to assembly.

e. Connect tubes and manifolds to fuel inlet ports, return, P2, P3, and P6. Torque tube nuts. (See figure 5, Sheet 2.)

f. Remove protective closures from cable connectors and receptacles on control.

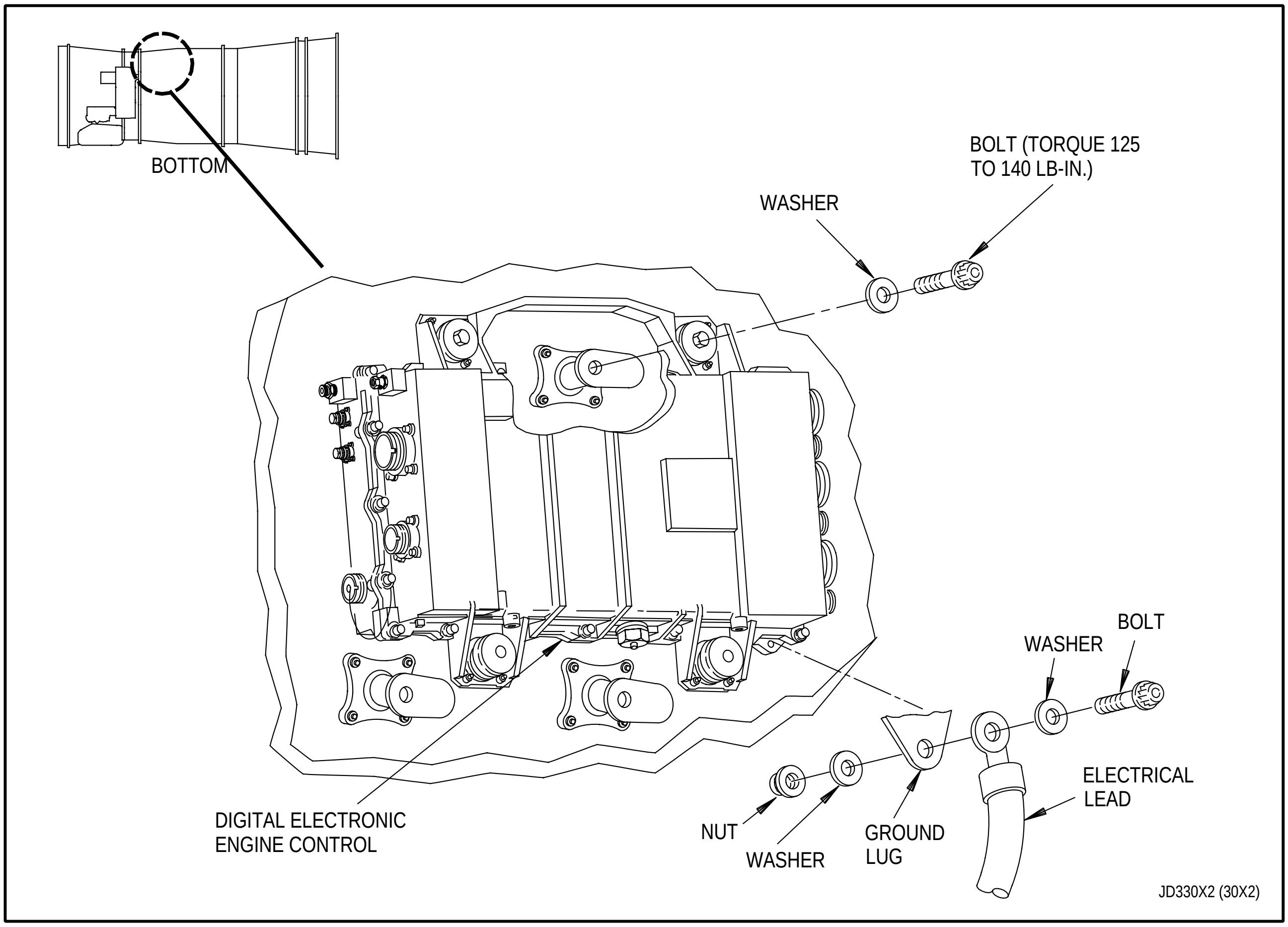


Figure 5. Digital Electronic Engine Control - Installation (Sheet 1 of 2)

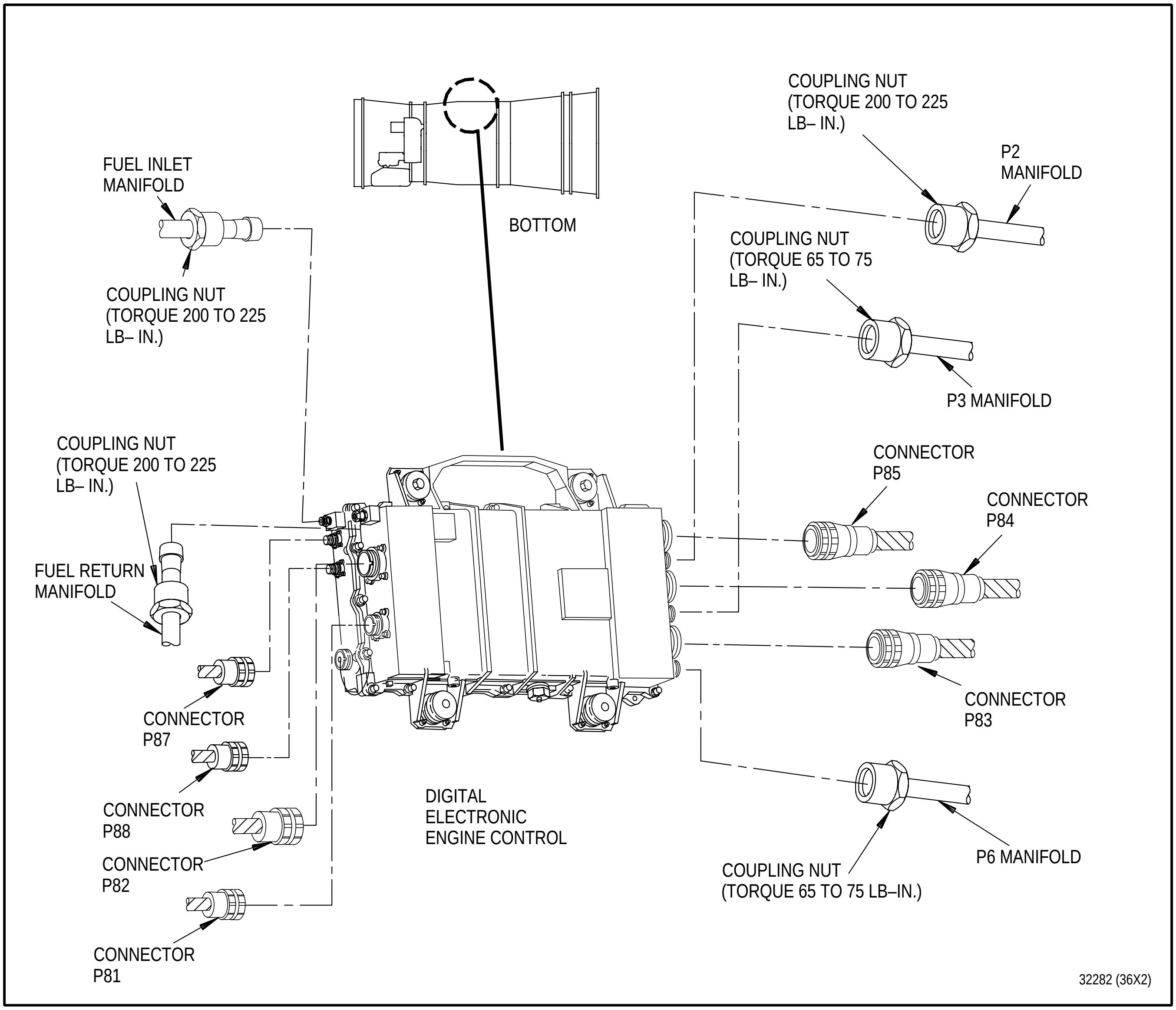


Figure 5. Digital Electronic Engine Control - Installation (Sheet 2 of 2)

g. Connect cable connectors P81, P82, P83, P84, P85, P87, and P88 to respective receptacles J81, J82, J83, J84, J85, J87, and J88 on control as follows:

(1) Align keyways and handtighten connector.

(2) Ensure red line on receptacle is not visible when viewed at right angles.

(3) Tighten connector firmly with soft-jawed pliers.

h. Perform Ps2 Plumbing Integrity Check as follows:

(1) Connect PWA 57796 Ps2 adapter to vacuum pump. Remove Ps2 adapter cap before using tool.

(2) Connect PWA 57796 Vacuum Tester Set to Ps2 probe.

CAUTION

- Do not apply pressure to Ps2 system. Damage may occur.
- Do not use liquids to check Ps2 system for leaks. DEEC transducer may be damaged.

(3) Evacuate Ps2 system, using hand vacuum pump until gage reads 8 to 16 inch HG. (4 to 8 PSIA). Monitor pump for 60 seconds. If leak is detected, look for Ps2 leaks in following areas and repeat this procedure until leak is corrected:

(a) Preformed packings in PWA 57796 Ps2 adapter.

(b) External plumbing.

(c) Ps2 probe.

(d) Inlet fan case.

(4) Release vacuum pressure to Ps2 probe prior to removing vacuum pump.

(5) Remove vacuum pump from probe.

i. Perform Pt6 Plumbing Integrity Check as follows:

WARNING

Working gloves are recommended for installing PWA 57796 Pt6 adapter to avoid injuring hands on adjacent hardware.

CAUTION

To prevent engine damage, do not put cap in engine.

(1) Connect PWA 57796 Pt6 adapter to vacuum pump. Remove Pt6 adapter cap before using tool.

(2) Carefully slide PWA 57796 Vacuum Tester Set on installed Pt6 probe. Lubricate Pt6 probe with MIL-L-7808 as required.

CAUTION

- Do not apply pressure to Pt6 system. Damage may occur.
- Do not use liquids to check Pt6 system for leaks. DEEC transducer may be damaged.

(3) Evacuate Pt6 system, using hand vacuum pump until gage reads 8 to 16 inch HG. (4 to 8 PSIA). Monitor pump for 60 seconds. If leak is detected, look for Pt6 leaks in following areas and repeat this procedure until leak is corrected:

(a) Preformed packings in PWA 57796 Pt6 adapter.

(b) External plumbing.

(c) Pt6 probe.

(4) Release pressure to Pt6 probe prior to removing vacuum pump.

(5) Remove vacuum pump from probe.

9. DIGITAL ELECTRONIC ENGINE CONTROL - STORAGE AND SHIPMENT.

NOTE

Preservation is not required for DEEC.

a. Purge and remove all attaching hardware. Refer to paragraph 3.

b. Cover all open ports and electrical connectors securely using protective closures.

CAUTION

Do not water wash or dip accessory in solvent as this procedure can cause severe internal corrosion damage.

c. If exterior of unit requires cleaning, wipe with clean cloth moistened with P-D-680, Type II petroleum solvent and dry with clean, dry, lint-free cloth.

d. Cover DEEC with waterproof material such as polyethylene film. Seal with PPP-7-60, Type III, Class I moisture resistant tape.

e. Pack DEEC in shipping container. If no mounting provisions are available, ensure unit is thoroughly cushioned with shock absorbent packing material.

WORK PACKAGE

TECHNICAL PROCEDURES

THERMOCOUPLE - IMMERSION, FTIT SENSING

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 42

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2	30	12	12	17 - 18	9
3	21	12A - 12F Added	12	19 - 25	0
4	9	13 - 14	12	26	30
4A	21	14A Added	12	27	8
4B Added	21	14B Blank Added	12	28	9
5 - 10	19	15 - 16A	21	29	0
11	21	16B Blank	21	30 Blank	9

REFERENCE MATERIAL REQUIRED

Title	Number
Engine ------------------------------------	T.O. 2J-F100-56-5
Borescope - Equipment and Operation ---------------	WP 021 00
Blades - Compressor Rotor, 2nd and 3rd Stages -Borescope Inspection ----------------------------------	WP 022 00
Blades - Compressor Rotor, 4th Stage; Vanes - Inlet Variable, Rear Compressor Stator; Fairing -Proximate Splitter, Compressor Intermediate Case - Fiberscope/ Borescope Inspection ------------------------	WP 023 00
Blades - Compressor Rotor, 6th, 7th, and 8th Stages -Borescope Inspection -----------------------	WP 024 00
Blades - Compressor Rotor, 12th and 13th Stages -Borescope Inspection -----------------------	WP 025 00
Chamber - Combustion; Nozzles - Fuel; Vanes - TurbineStator, 1st and 2nd Stages; Blades - Turbine Rotor, 1st Stage - Fiberscope/Borescope Inspection ---	WP 026 00
Blades - Turbine Rotor, 2nd and 3rd Stages - BorescopeInspection --------------------------	WP 027 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
ADHESIVE	LOCTITE SUPERBONDER 495 (OR EQUIVALENT)
ALCOHOL, DENATURED	O-E-760, TYPE III
CLOTH, DRY LINT-FREE	-
COMPOUND, ANTIGALLING (PWA 550)	HI-T-650 OR LUBRI-BOND HT
LOCKWIRE	MS9226-04 (0.032 INCH DIAMETER)
MILK OF MAGNESIA	COMMERCIALLY AVAILABLE
PETROLATUM	VV-P-236

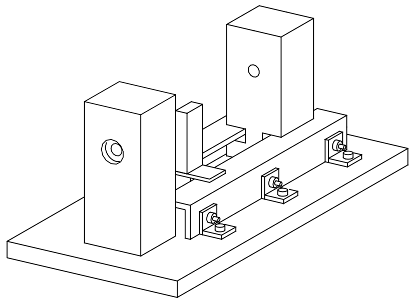
EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
PACKING, PREFORMED	MS9386-122	7

APPLICABLE SUPPORT EQUIPMENT

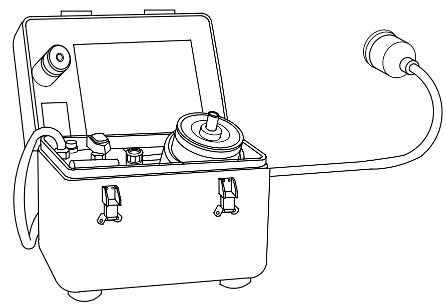
Paragraph	Function - Tool Nomenclature	Tool Number
2	FTIT Sensing Immersion Thermocouples - System Check	
	Ohmmeter, PSM-6(or equivalent)	NSN 6625-00-643-1686
3	FTIT Sensing Immersion Thermocouples - Removal	
	Puller	PWA 55814
3A	FTIT Sensing Immersion Thermocouples - Broken Probe Tip Removal	
	PWA 55190 Kit - FTIT Probe Tip Removal	
	Collet Assembly	PWA 55192
	Adapter	PWA 55193
	Guide	PWA 55195
	Drill Assembly	PWA 55197
	Puller, FTIT Probe Removal	PWA 55814 or PWA 55191
	Hand Drill	PWA 55198
5	FTIT Sensing Immersion Thermocouple - Inspection	
	Ohmmeter, PSM-6 (or equivalent)	NSN 6625-00-643-1686
6	FTIT Sensing Immersion Thermocouple - Sheath and Tip Repair	
	Fixture, FTIT Probe Alignment	PWA 56606 OR LM 1017
8	FTIT Sensing Immersion Thermocouple - Seating Verification	
	Kit - Aircraft Engine Maintenance	PWA 56075
	Light Source Assembly - Fiber Optics	PWA 50144
	Tube - Guide	PWA 52041
9	FTIT Sensing Immersion Thermocouple - Installation	
	Fixture, Inspection - FTIT Probe Seated on TurbineCase	PWA 55422
	Tap, thread 10-32-UNJF-3B (or equivalent)	TAPCO PN 72072 (CAGE 7X007)

ILLUSTRATED SUPPORT EQUIPMENT



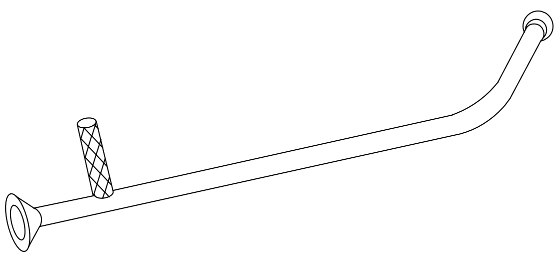
LM 1017 –C

Figure T1. LM 1017 FTIT Fixture



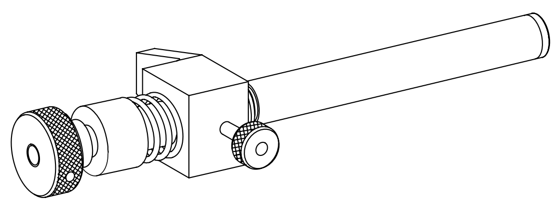
PWA 50144 –C

Figure T2. PWA 50144 Light Source



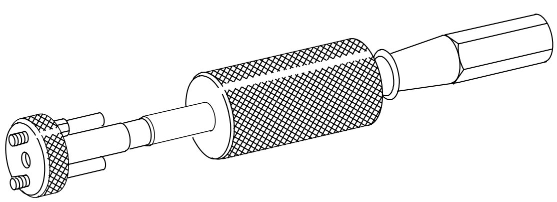
PWA 52041 –C

Figure T3. PWA 52041 Tube



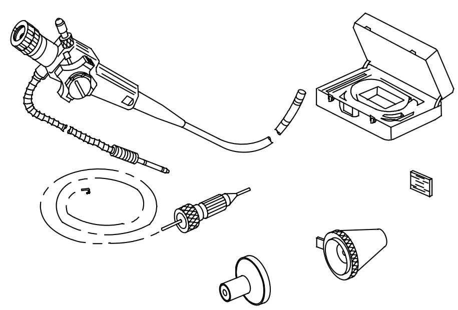
PWA 55422 –C

Figure T4. PWA 55422 Fixture



PWA 55814 –C

Figure T5. PWA 55814 Puller



PWA 56075 –C

Figure T6. PWA 56075 Borescope Kit

ILLUSTRATED SUPPORT EQUIPMENT (Continued)

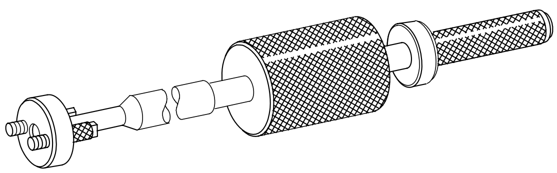


Figure T7. PWA 55191 Puller

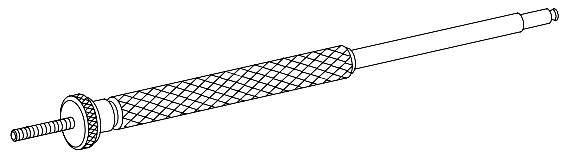


Figure T8. PWA 55192 Collet

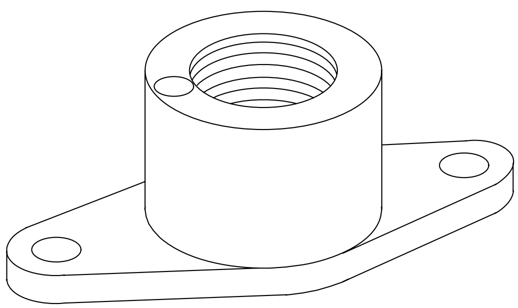


Figure T9. PWA 55193 Adapter

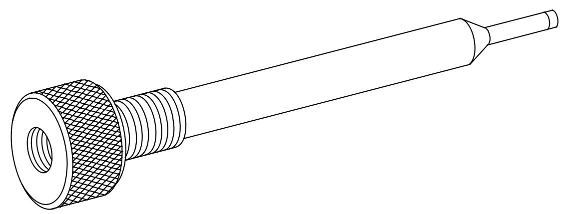


Figure T10. PWA 55195 Guide

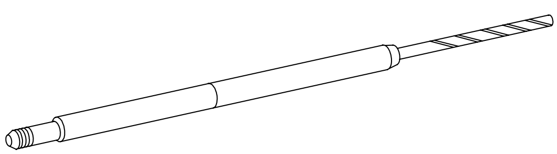


Figure T11. PWA 55197 Drill

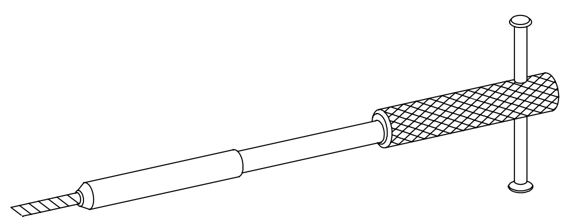


Figure T12. PWA 55198 Drill

ILLUSTRATED SUPPORT EQUIPMENT (Continued)

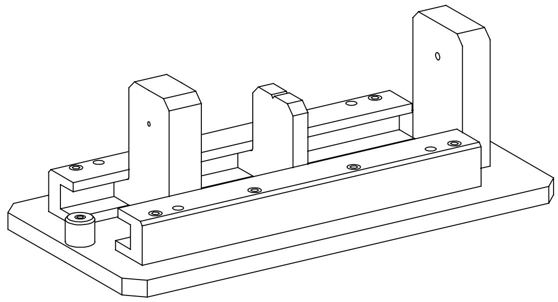


Figure T13. PWA 56606 Fixture

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures on the FTIT sensing immersion thermocouples:

- System check
- Removal
- Cleaning
- Inspection
- Sheath and tip - Repair
- Retaining pin - Repair
- Installation (manual)
- Seating verification
- Installation using PWA 55422 fixture
- Storage and shipment

2. FTIT SENSING IMMERSION THERMOCOUPLES - SYSTEMS CHECK.

(See Figures 1 through 3 and Tables 1 through 3.)

NOTE

Simpson Model 260 ohmmeter (20vdc maximum output) may be used for this check.

a. Remove P81 connector from digital electronic engine control (DEEC) and P48 connector from engine diagnostic unit (EDU). Perform resistance checks per figures 1 and 2, and table 1.

b. If resistance checks are out of limits, replace thermocouple cable.

c. If resistance checks are within limits, perform circuit resistance checks per figures 1 and 2, and table 2.

NOTE

Probe A, B, C, and D designations are located on inside of cable connector. See Figure 3.

d. Remove connectors P38 through P44 from FTIT sensors and perform individual FTIT sensor resistance checks per figure 3 and table 3.

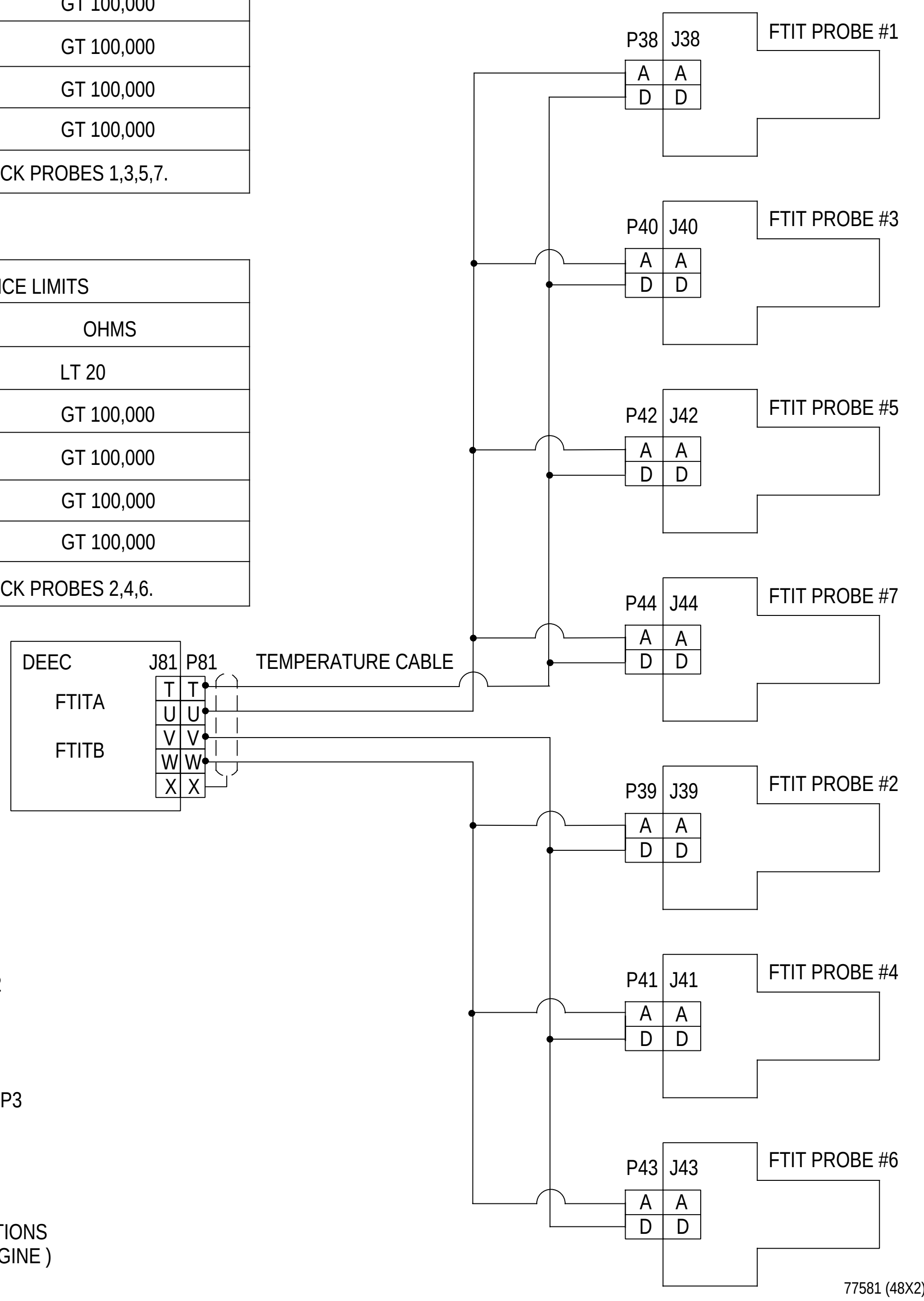
e. If P81 and/or P48 checks are out of limits and individual sensor checks are within limits, replace thermocouple cable.

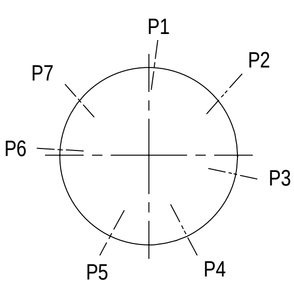
f. Replace FTIT sensors that fail individual sensor resistance checks.

g. Reconnect connector P81 to DEEC, P48 to EDU, and connectors P38 through P44 to FTIT sensors.

FTITA RESISTANCE LIMITS	
PINS (P81)	OHMS
T TO U	LT 20
U TO GND	GT 100,000
T TO GND	GT 100,000
T TO X	GT 100,000
U TO X	GT 100,000
IF P81 CHECKS OUT OF LIMITS, CHECK PROBES 1,3,5,7.	

FTITB RESISTANCE LIMITS	
PINS (P81)	OHMS
V TO W	LT 20
V TO GND	GT 100,000
W TO GND	GT 100,000
V TO X	GT 100,000
W TO X	GT 100,000
IF P81 CHECKS OUT OF LIMITS, CHECK PROBES 2,4,6.	





FTIT PROBE PHYSICAL LOCATIONS
(LOOKING FROM REAR OF ENGINE)

77581 (48X2)

Figure 1. FTIT A and FTIT B Probe Circuits

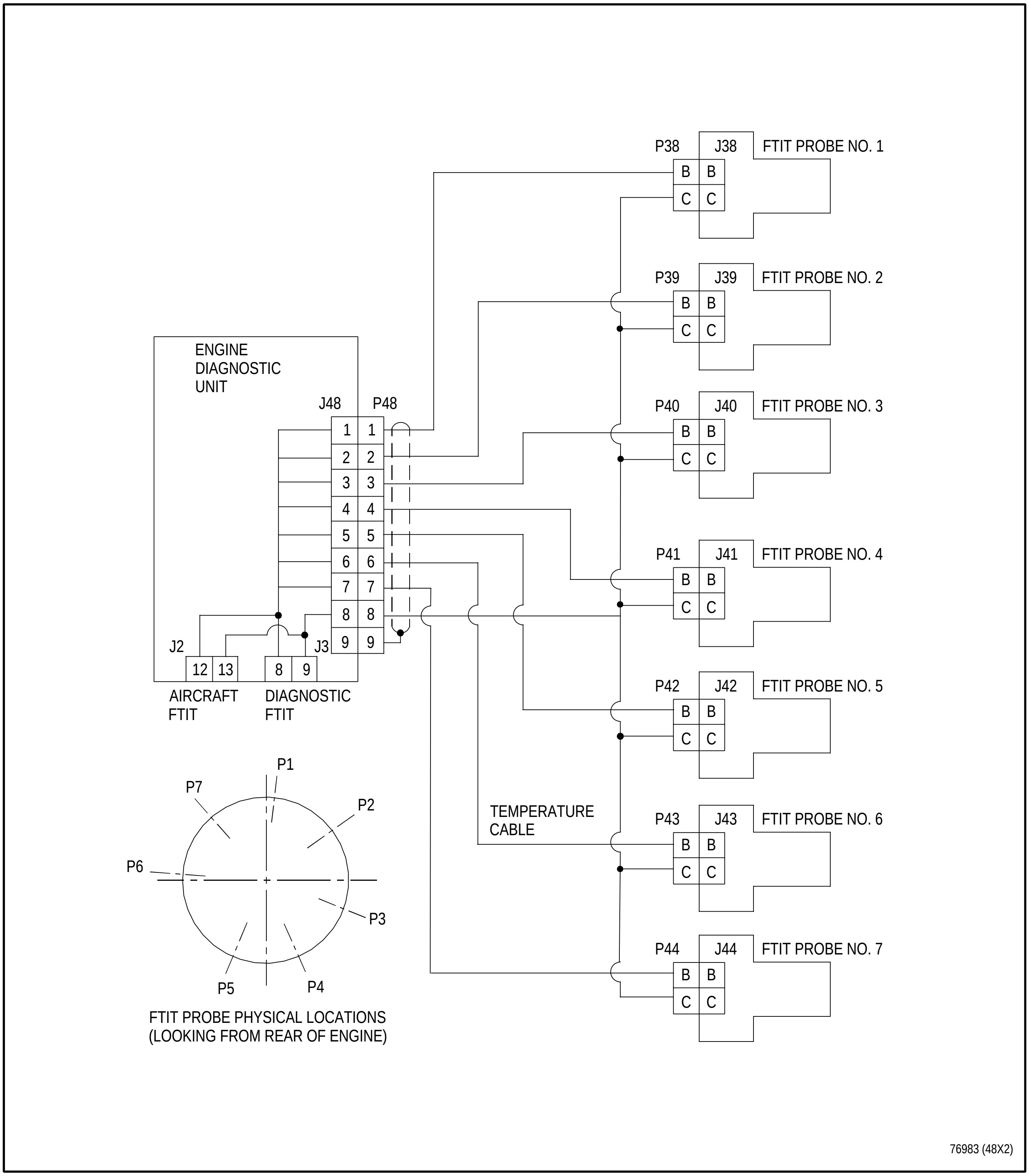


Figure 2. FTIT Indicator Circuit

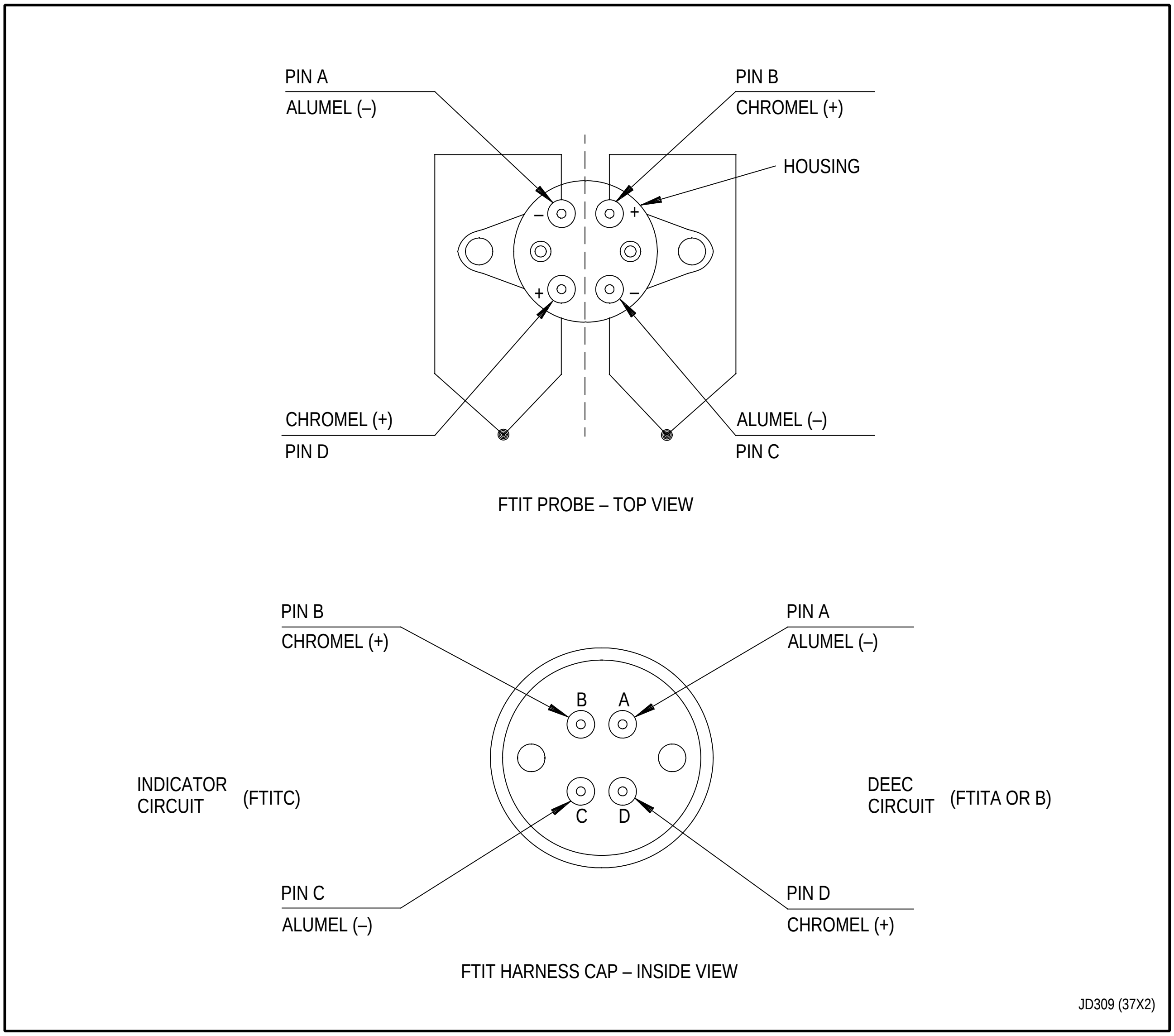


Figure 3. FTIT Probe and Harness Cap Pin Location

Table 1. FTIT Cable Shielding Checks

Pins (P81)	Ohms
T to X	Greater than (GT) 100,000
U to X	GT 100,000
V to X	GT 100,000
W to X	GT 100,000
Pins (P48)	Ohms
1 to 9	GT 100,000
2 to 9	GT 100,000
3 to 9	GT 100,000
4 to 9	GT 100,000
5 to 9	GT 100,000
6 to 9	GT 100,000
7 to 9	GT 100,000
8 to 9	GT 100,000

Table 2. FTIT Circuit Checks

DEEC FTITA CIRCUIT	
Pins (P81)	Ohms
T to U	Less than (LT) 20
U to Case	Greater than (GT) 100,000
T to Case	GT 100,000
DEEC FTITB CIRCUIT	
Pins (P81)	Ohms
V to W	LT 20
W to Case	GT 100,000
V to Case	GT 100,000
FTIT INDICATOR CIRCUIT	
Pins (P48)	Ohms
1 to 8	LT 20
2 to 8	LT 20
3 to 8	LT 20
4 to 8	LT 20
5 to 8	LT 20
6 to 8	LT 20
7 to 8	LT 20
8 to Case	GT 100,000

Table 3. FTIT Sensor Checks

INDIVIDUAL SENSOR CHECKS	
Pins (P38 thru P44)	Ohms
A to D	Less than (LT) 5
B to C	LT 5
A to C	Greater than (GT) 750,000
B to D	GT 750,000
A to Case	GT 750,000
B to Case	GT 750,000
C to Case	GT 750,000
D to Case	GT 750,000

3. FTIT SENSING IMMERSION THERMOCOUPLES - REMOVAL.
(See Figure 4.)

NOTE

- Thermocouple cable is red.
- Bolts and washers in cable connector are captive.

a. Loosen bolts and washers to disengage thermocouple cable from thermocouple. (See figure 4.)

b. Remove and discard packing.

c. Remove nuts.

CAUTION

Twisting a thermocouple during removal can damage probe tip.

d. Using PWA 55814 puller, apply minimum force necessary to remove thermocouple. Do not twist a stuck thermocouple.

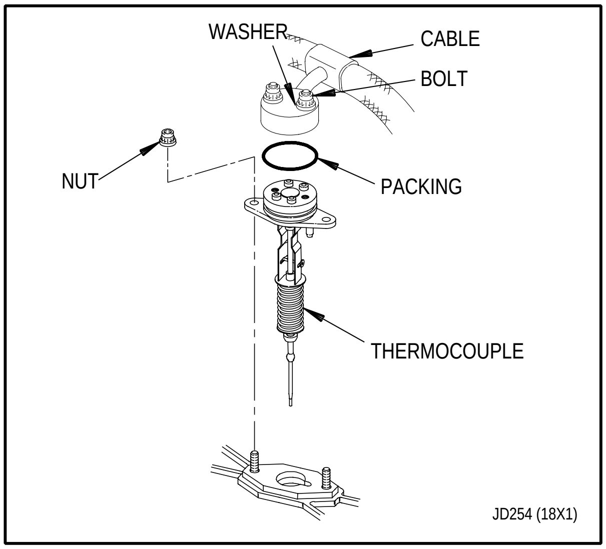


Figure 4. FTIT Sensing Immersion Thermocouples (Typical) - Removal

e. Inspect removed thermocouple to ensure tip and sheath are intact. If part of the probe has broken off and remains in the vane, remove broken part per paragraph 3A.

3A. FTIT SENSING IMMERSION THERMOCOUPLES - REMOVAL OF BROKEN PROBE TIPS.
(See Figures 4A and 4B.)

CAUTION

Carefully follow this procedure when removing broken FTIT probe to avoid further engine disassembly.

NOTE

PWA 55192 collet is used when there is enough probe exposed for attachment and removal per step b. PWA 55197 or PWA 55198 drills are used for probe removal per step c. when there is not enough probe exposed for collet.

a. Inspect probe to determine amount of broken probe remaining in vane. Light FTIT port area to look at the remaining exposed piece of probe tip.

b. If there is enough probe left for attachment of PWA 55192 collet assembly proceed per figure 4A:

(1) Install PWA 55193 adapter to probe mount boss using removed probe bolts and nuts.

(2) Loosen knob on handle of PWA 55192 collet assembly to open collet jaws.

(3) Insert PWA 55192 collet assembly through installed PWA 55193 adapter and position collet jaws over end of broken probe.

CAUTION

Be certain collet has a firm grip on probe, but not so tight as to bend collet jaws.

(4) Clamp collet jaws around probe tip by tightening knob.

(5) Attach PWA 55191 puller to threaded end of PWA 55192 collet assembly.

(6) Tap lightly with slide hammer to remove broken probe tip while holding puller securely.

NOTE

If part of probe tip or sleeve is missing, assume it is still in the vane and must be extracted per step c.

(7) Inspect probe tip after removal to ensure all of probe has been removed from vane.

(8) If removal of probe tip is complete, disassemble PWA 55193 adapter and return with PWA 55192 collet assembly to PWA 55190 FTIT probe and tip removal kit.

(9) If probe tip removal is not complete, go to step c.

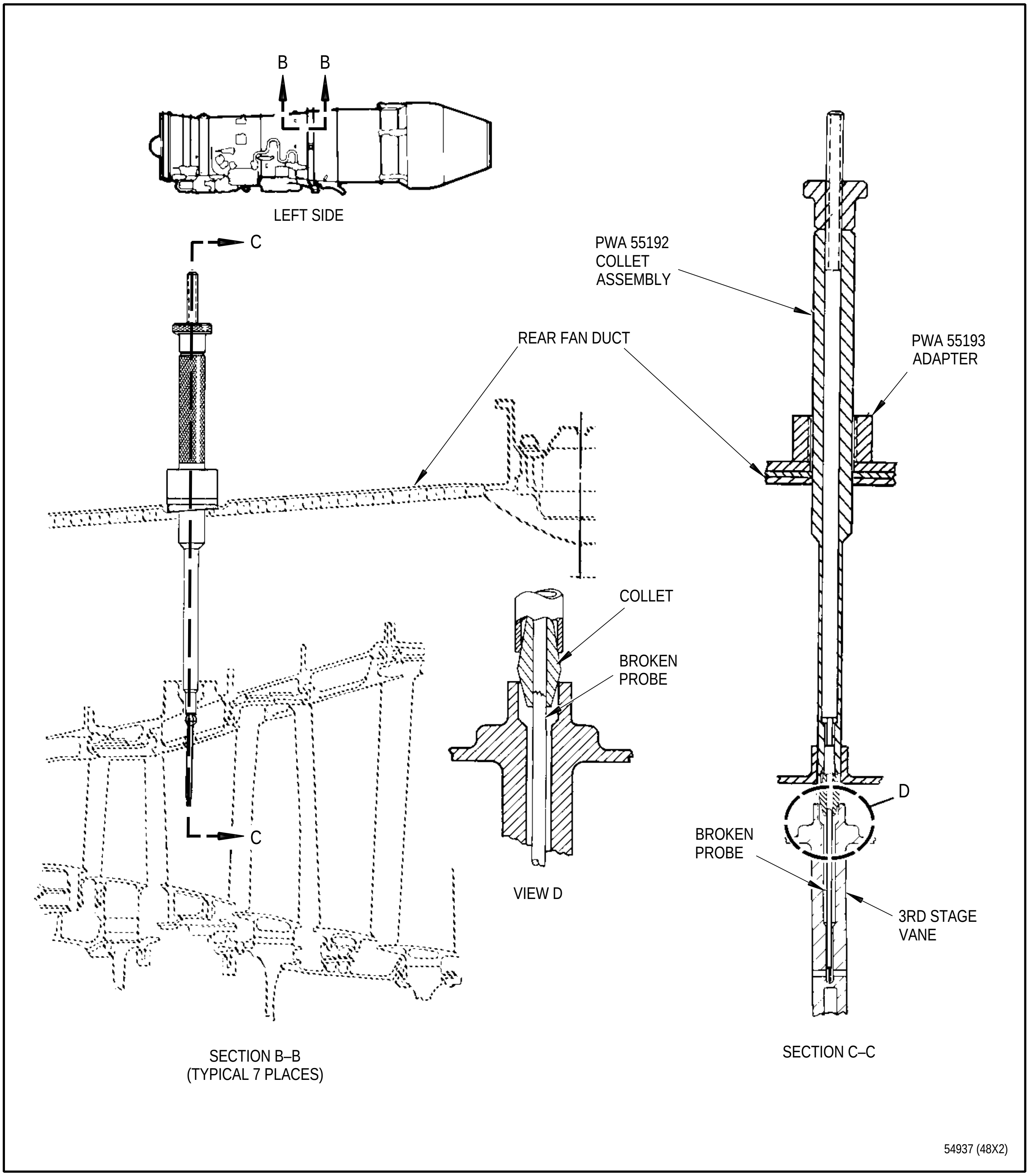


Figure 4A. FTIT Sensing Immersion Thermocouples - Broken Probe Tip Outside Third Stage Vane Removal

c. If there is not enough probe exposed for removal with collet assembly, drill tools shall be used in the following order per figure 4B:

(1) Install PWA 55193 adapter to appplicable FTIT probe mount boss using removed FTIT probe bolts and nuts.

(2) Thread PWA 55195 guide into PWA 55193 adapter until it bottoms, but not tightly.

(3) Use the following procedures with PWA 55198 hand drill assembly if only the FTIT probe tip is lodged in the vane.

CAUTION

Excess adhesive can cause drill to stick to vane.

(a) Apply a small drop of adhesive (Loctite Superbonder 495 or equivalent) to end of drill.

(b) Insert hand drill through PWA 55195 guide until drill is in firm contact with loose tip.

(c) Let adhesive set for several minutes to permit thorough bonding.

CAUTION

Be careful not to knock off and lose broken part. It is needed to verify entire probe tip has been removed and no material remains in vane.

NOTE

If the following step is not successful, it may be necessary to repeat steps 3 (a), (b), (c) and (d) several times.

(d) Very cautiously and without twisting, withdraw hand drill to retrieve probe tip.

NOTE

If more than probe tip is missing, the broken probe part is probably too firmly lodged for easy removal by the above procedure.

(e) Verify that all of broken probe tip has been removed and if more than probe tip is missing go to next step (4).

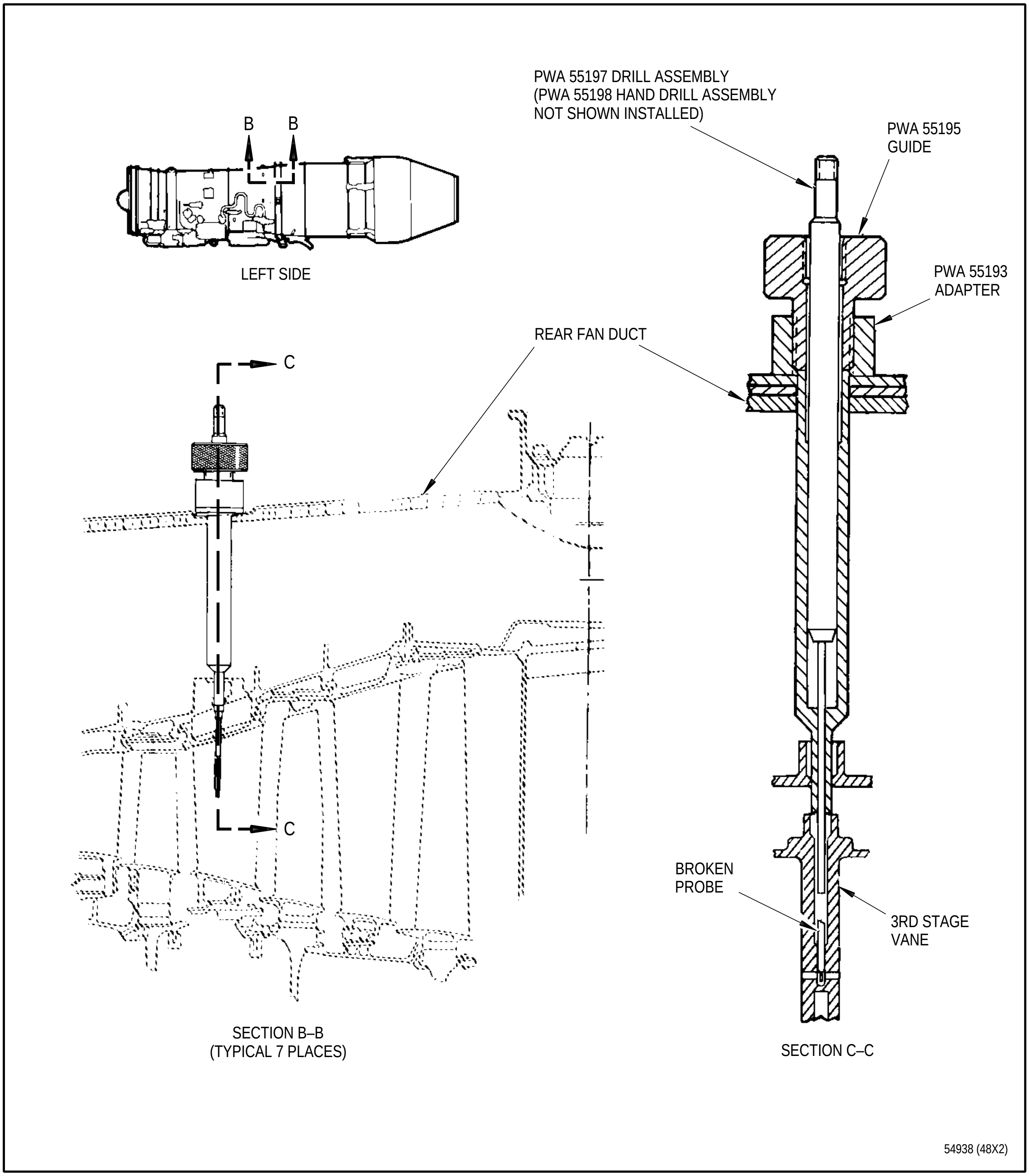


Figure 4B. FTIT Sensing Immersion Thermocouples - Broken Probe Tip Inside Third Stage Vane Removal

(4) Dislodge broken probe part using PWA 55197 drill assembly and a very slow speed air drill as follows:

CAUTION

This drilling operation is intended only to loosen the broken probe part. Do not attempt to drill out the part as the drill can break and possibly damage turbine vane.

(a) Insert drill through PWA 55195 guide until broken probe part is contacted.

(b) Start drill turning at very slow speed. Use light pressure against broken part to free it.

CAUTION

Be careful not to knock off and lose broken part. It is needed to verify entire probe tip has been removed and no material remains in vane.

(c) When part is loosened, very cautiously and without twisting, withdraw drill to retrieve the broken part.

CAUTION

Excess adhesive can cause drill to stick to vane.

(d) If broken part did not come out of vane with drill, repeat step (3)(c).

(e) If PWA 55197 drill turns freely in larger sleeve of broken probe and is unable to bite into probe to free it, stop and use PWA 55198 hand drill as follows:

1 Insert hand drill through PWA 55195 guide until broken part is contacted.

2 Slowly turn handle clockwise with light pressure to try to bite into thin sleeve portion of broken probe to loosen it. If unsuccessful, try using adhesive per step (3)(c).

3 When a hold is made, withdraw drill and broken part.

(5) If preceding procedures were unsuccessful in removing entire probe and any portion remains in vane, engine must be disassembled for applicable vane replacement.

(6) Remove PWA 55195 guide and PWA 55193 adapter. Return to PWA 55190 FTIT probe and tip removal kit along with other kit components used.

4. FTIT SENSING IMMERSION THERMOCOUPLE - CLEANING.

a. Clean deposits from thermocouple with a lint-free cloth moistened with denatured alcohol. Dry with compressed air or with a dry, lint-free cloth.

b. Wipe off any residue from terminals.

5. FTIT SENSING IMMERSION THERMOCOUPLE - INSPECTION.

(See Figures 5 and 6.)

NOTE

FTIT thermocouple sheath and tip are one assembly and shall be referred to as TIP.

a. Inspect thermocouple. See figure 5.

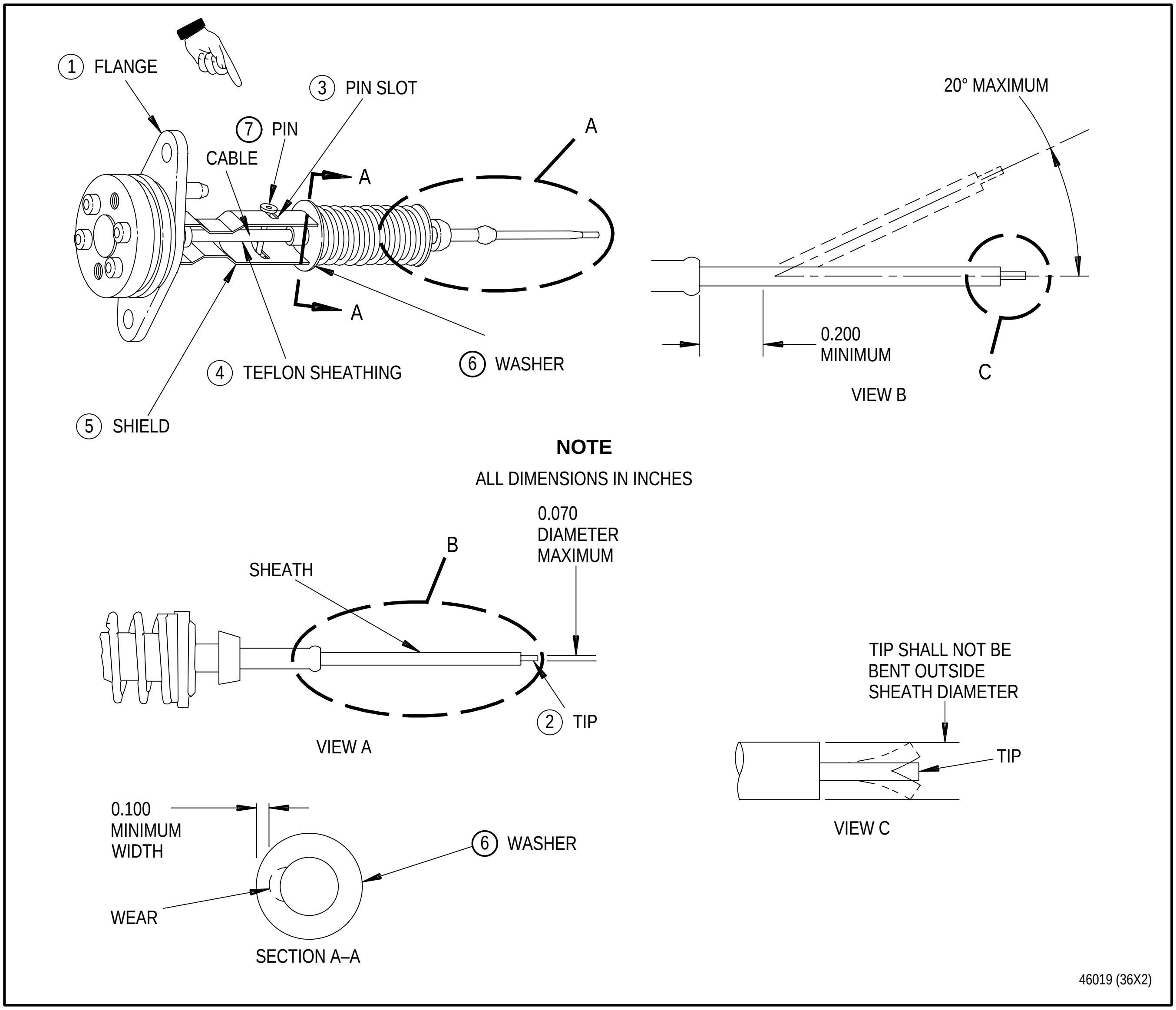


Figure 5. FTIT Immersion Thermocouple - Inspection

Legend to figure 5

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action

NOTE

Streaks of soot on flange of thermocouple may indicate that flange is bent.

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Flange -			
Bent	Not serviceable	Not reparable	Replace thermocouple.
2. Tip -			
Cracks (use 10X magnifying glass)	Not serviceable	Not reparable	Replace thermocouple.
Expanded	0.070 inch maximum tip diameter	Not reparable	Replace thermocouple.
Bent	Sheath cannot be bent beyond 6 degrees. (See view B.)	20 degrees	Repair. Refer to paragraph 6.
Pitting, erosion (use 10X magnifying glass)	Serviceable as long as insulation not exposed.	Not reparable	Replace thermocouple.
3. Pin slot -			
Wear	Wear is serviceable as long as pin is not missing or cannot be removed.	Not reparable	Replace thermocouple.
4. Teflon sheathing -			
Cuts, tears, or rips	Any amount is serviceable as long as cable insulation is not exposed and thermocouple can be installed properly.	Not reparable	Replace thermocouple.
5. Shield -			
Damage, cracking, or warping	Not serviceable	Not reparable	Replace thermocouple.

Legend to figure 5 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
	NOTE		
6. Washer -			
Wear	Wear is serviceable as long as washer width is 0.100 inch minimum. Up to four wear areas are allowed as long as 0.100 inch minimum width is not exceeded.	Not reparable	Replace thermocouple.
7. Retaining pin -			
Missing	Not serviceable	Reparable	Repair missing retaining pin per paragraph 6A.

b. Check circuit resistance between terminals using a calibrated ohmmeter. (See figure 6.) Resistance readings between Terminals B and C and between Terminals A and D should be less than 5.00 ohms. Record results of resistance test in engine log.

c. Check insulation resistance using ohmmeter for a minimum of 750,000 ohms by checking resistance of each pin to case and between pins diagonally.

d. If thermocouple has less than 300 ohms insulation resistance, do the following:

(1) Borescope inspect engine hot section for damage. Refer to T.O. 2J-F100-53-5, WPs 026 00 and 027 00.

(2) Replace faulty thermocouple.

(3) Perform FTIT sensing system check. Refer to paragraph 2.

(4) Record resistance test result in engine log.

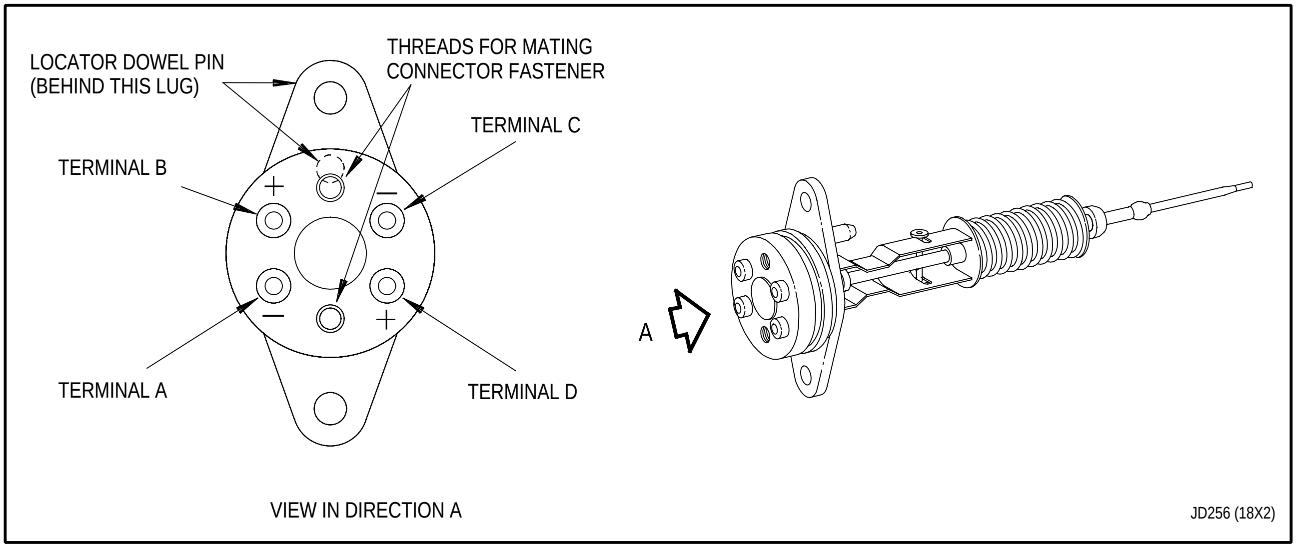


Figure 6. FTIT Immersion Thermocouple - Circuit Resistance Check

6. FTIT SENSING IMMERSION THERMOCOUPLE - SHEATH AND TIP REPAIR.

(See figures 5 and 7, and Figure 8.)

NOTE

PWA 56606 fixture or LM 1017 fixture may be used.

a. If thermocouple sheath is bent within reparable limits, as shown in figure 5, and PWA 56606 FTIT probe alignment fixture will be used, perform the following procedure (see figure 7). If a locally manufactured alignment fixture LM 1017 will be used, go to step b.

(1) Insert thermocouple through PWA 56606 fixture block.

(2) Slide alignment fixture slide to bend in thermocouple sheath. Sheath shall rest in slide groove for proper repair.

NOTE

Slight springback of thermocouple sheath may require deflecting sheath beyond straight alignment.

(3) Straighten thermocouple sheath by applying finger pressure evenly across length of sheath.

(4) Carefully slide fixture tip location guide over thermocouple tip to ensure correct alignment. If unable to align tip properly, go to step (5).

(5) Rotate thermocouple assembly in slide groove and repeat steps (2), (3), and (4) to obtain correct alignment.

(6) Ensure no cracks exist in area of bend repair.

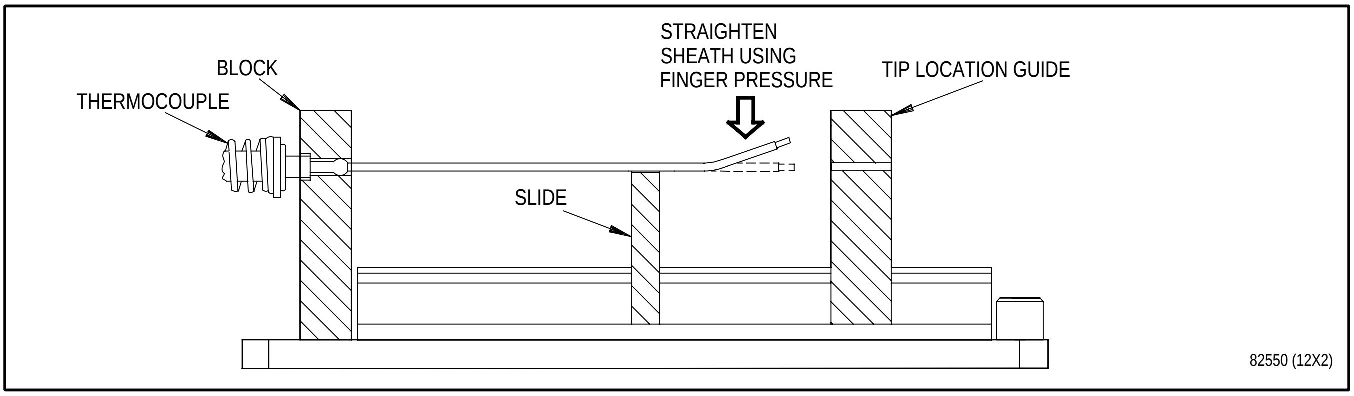


Figure 7. FTIT Sensing Immersion Thermocouple - Sheath Alignment Repair Using PWA 56606 Fixture.

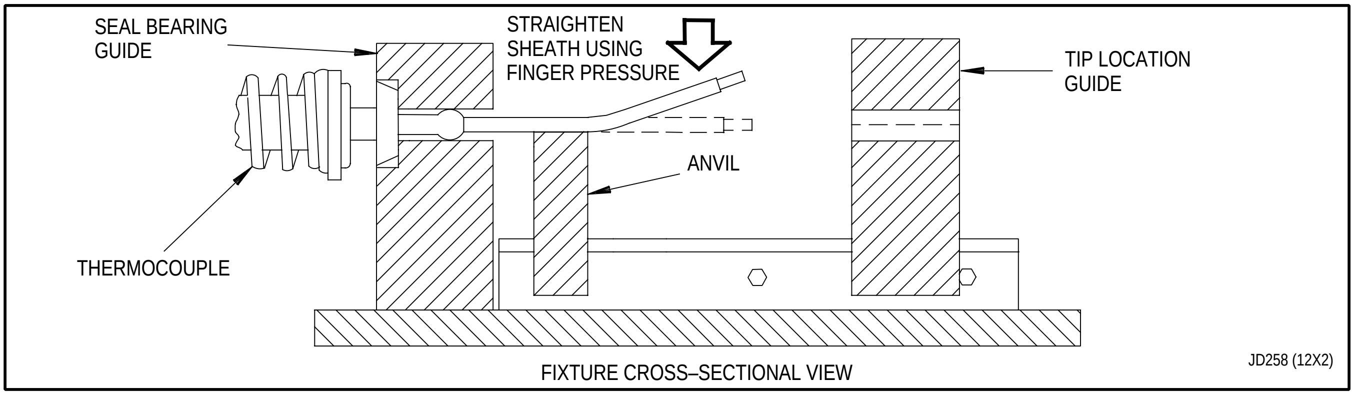


Figure 8. FTIT Sensing Immersion Thermocouple - Sheath Alignment Repair Using LM 1017 Fixture

b. If thermocouple sheath is bent within reparable limits per figure 5, and locally manufactured alignment fixture LM 1017 will be used, do the following. (See figure 8).

(1) Insert thermocouple through LM 1017 fixture seal bearing guide.

(2) Slide alignment fixture anvil to bend in thermocouple sheath. Sheath shall rest in anvil groove for proper repair.

NOTE

Slight springback of thermocouple sheath may require deflecting sheath beyond straight alignment.

(3) Straighten thermocouple sheath by applying finger pressure evenly across length of sheath.

CAUTION

Using force to slide locator guide over probe tip may damage probe.

(4) Carefully attempt to slide, but not force, alignment fixture tip locator guide over thermocouple tip to ensure correct alignment. If unable to align tip properly, go to step (5).

(5) Rotate thermocouple assembly in alignment fixture sheath anvil groove and repeat steps (2), (3), and (4) to obtain correct alignment.

(6) Ensure no cracks exist in area of bend repair.

Paragraph 6A and figures 8A and 8B deleted.

7. FTIT SENSING IMMERSION THERMOCOUPLE - MANUAL INSTALLATION. (See Figure 9.)

NOTE

Two people are required to install thermocouples manually. One person installs thermocouple while the other inspects for proper seating with a mirror from inside the augmentor.

a. Hold a mirror inside augmentor to watch thermocouple being installed and to ensure it is seated properly.

b. Apply a light coat of PWA 550 antigalling compound to threads of studs. (See figure 9, Sheet 1.)

c. Insert thermocouple in engine while aligning locating pin with pin hole.

d. Install nuts on studs. Torque nuts 23 to 26 pound-inches.

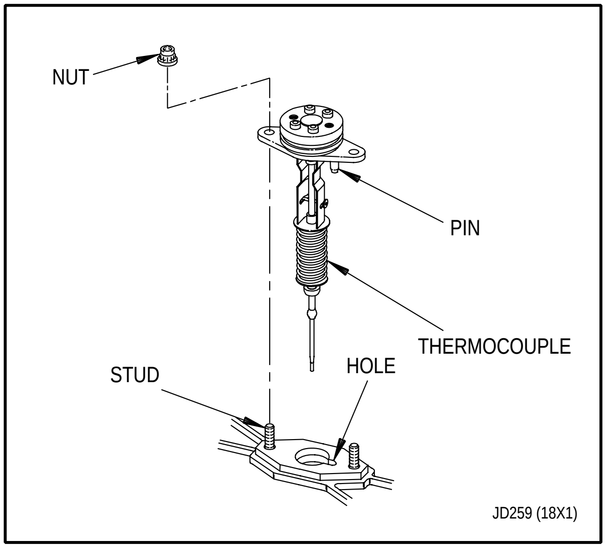


Figure 9. FTIT Sensing Immersion Thermocouple (Typical) - Manual Installation (Sheet 1 of 3)

e. Wipe off excess lubricant from packing and thermocouple ensuring cable contacts are clean.

f. Lubricate PN MS9386-122 packing with a light coat of VV-P-236 petrolatum. Remove excess lubricant.

g. Install packing on thermocouple. (See figure 9, Sheet 2.)

NOTE

Ensure that washers are installed on cable connector bolts and bolts have no thread damage to prevent bottoming out or binding in probe.

h. Install cable connectors P38 through P44 to thermocouples as follows:

(1) Inspect cable cap bolt threads for damage and debris. Replace/clean as required.

(2) Apply PWA 550 anti-galling compound to cable cap bolt threads if none is present.

CAUTION

Ensure there is no anti-gallant on contacts of thermocouples or cable probe caps. To avoid electrical short circuit.

(3) Install cable cap bolts fingertight until bolts bottom on cable cap. If bolts bind, remove bolts and chase insert threads using 10-32-UNJF-3B tap. Clean threads as required.

(4) Reinstall cable cap bolts fingertight until bolts bottom on cable cap. Torque bolts 10 to 15 pound-inches. Lockwire with MS9226-04 wire.

i. If a gap exists between inner case boss and thermocouple spring washer, verify thermocouple seating. Refer to paragraph 8.

j. Install remaining thermocouples per steps a. through h.

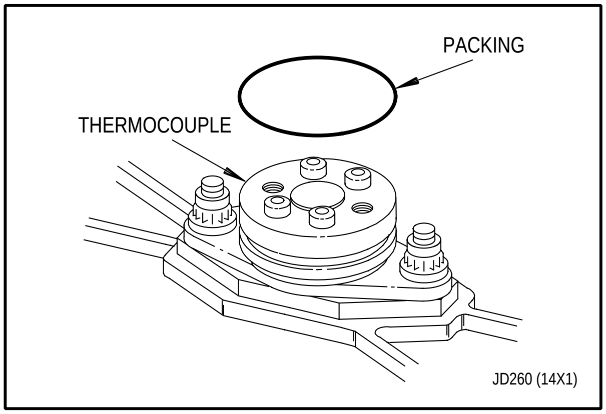


Figure 9. FTIT Sensing Immersion Thermocouple - Manual Installation (Sheet 2 of 3)

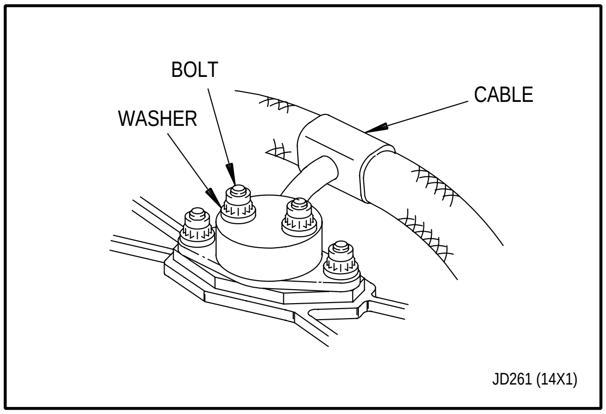


Figure 9. FTIT Sensing Immersion Thermocouple - Manual Installation (Sheet 3 of 3)

8. FTIT SENSING IMMERSION THERMOCOUPLE - SEATING VERIFICATION.
(See Figures 10 through 12.)

a. Preparation of the PWA 56075 borescope for use.

(1) Remove FBA-6-150 PW flexible borescope and LGA-6K light source adapter from kit.

(2) Install light source adapter onto end of flexible borescope fiber optics.

b. Set up of PWA 50144 fiber optics light source:

(1) Turn light intensity rotary switch to off position; then connect power cord to 120 volt 60 Hz outlet.

(2) Install end of fiber optics adapter into receptacle of fiber optics light source before activating power switch.

(3) Turn rotary switch to position 1 for most observations.

(4) When line voltage is 105 volts AC or below, increase illumination to switch setting 6 or 7. Illumination will stay at level 5 until red button is pressed (not held). Light will increase for 15 to 25 seconds and return to level 5 voltage. Bulb life is reduced at levels 6 and 7, which are only used when taking photographs, measurements, or when voltage is 105 volts or less.

c. To change and align light bulb in PWA 50144 fiber optics light source assembly:

(1) Turn rotary switch (light intensity) to OFF, and remove cord from power source.

(2) Remove end of fiber optics adapter from end of light housing.

(3) Remove one captive screw from each side of finned housing.

(4) Remove housing and rest on bumpers.

(5) Pry out bulb and replace.

(6) Ensure that preformed packing is seated in groove of base.

(7) Install light housing aligning flange hole with pin of base mount. Seat and secure with two screws.

(8) Remove alignment tool from lid and install into end of light housing (like fiber optics adapter).

(9) Ensure rotary switch is in off position, then connect cord to power source. Turn switch to position 1.

(10) Adjust screws at 4 and 12 o’clock positions on light housing to center filament image in aperture.

(11) Adjust spring plunger at 7:30 o’clock position so tool is firm but readily removable.

CAUTION

Forcing a flexible borescope causes the glass fibers inside the objective light bundle to break reducing clarity and resolution.

d. Carefully insert flexible borescope into PWA 52041 guide tube.

e. Insert guide through augmentor nozzle and into rear fan duct, through space between augmentor spray manifolds, and in line with a FTIT sensing immersion thermocouple. (See figure 10.)

(1) Gently articulate distal tip up and down and roll borescope clockwise, or counterclock wise, locating thermocouple spring retaining washer.

(2) Locate thermocouple spring area.

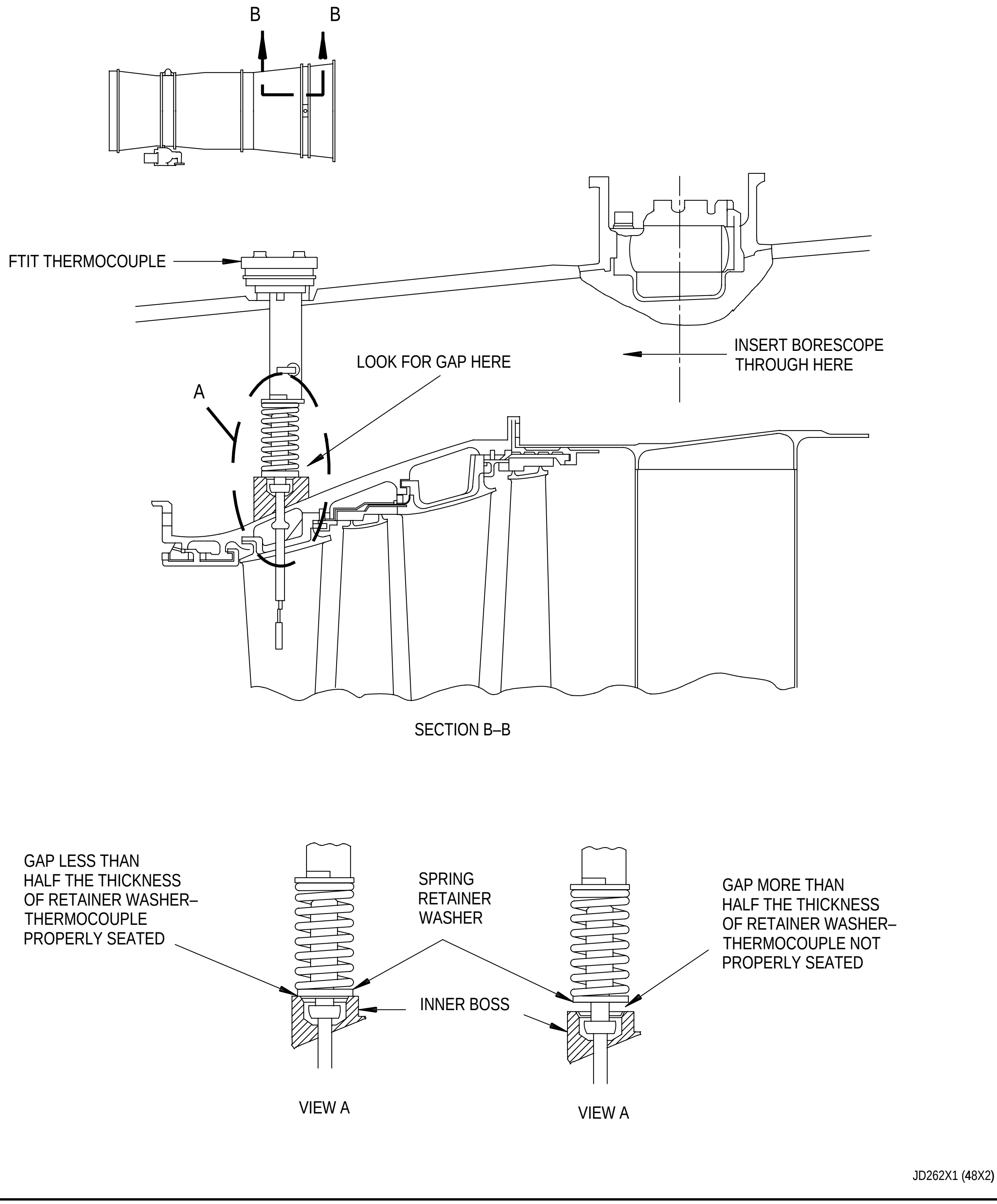


Figure 10. FTIT Sensing Immersion Thermocouple - Seating Verification

f. Flexible borescope operation:

(1) Focus borescope and obtain clearest setting for users vision. Rotate focus knob, located under eyepiece on viewing head. (See figure 11, Sheet 1.)

(2) Adjust angle lever to control tip bending section of optic bundle. (See figure 11, Sheet 2.)

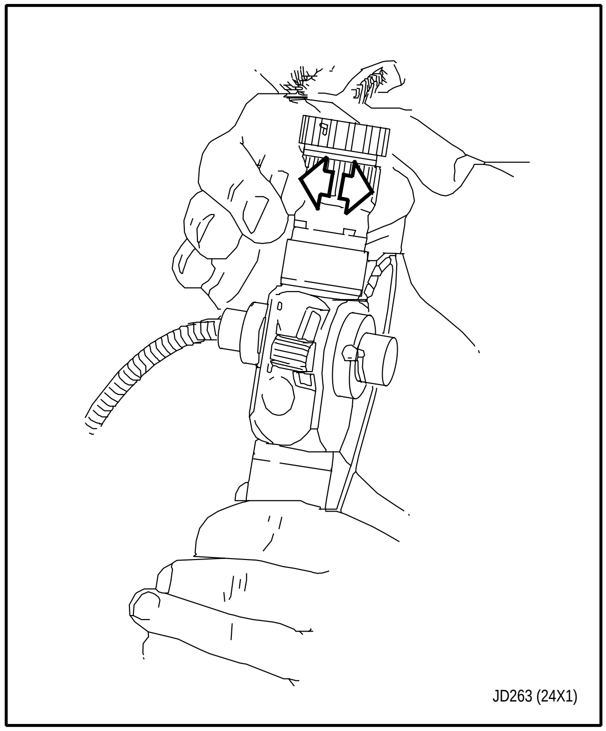


Figure 11. Operation of Flexible Borescope (Sheet 1 of 3)

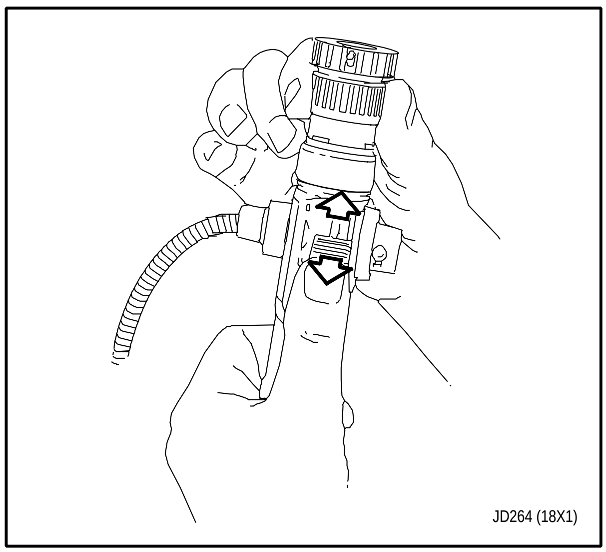


Figure 11. Operation of Flexible Borescope (Sheet 2 of 3)

(3) Set angle brake to prevent tip bending section movement once properly positioned. (See figure 11, Sheet 3.)

g. Determine if gap exists between spring retainer washer and turbine case boss. (See figure 10.)

(1) Thermocouple is properly seated if gap between turbine case boss and spring retainer washer is less than 1/2 the thickness of spring retainer washer.

(2) Thermocouple is not seated properly if gap is more than 1/2 the thickness of spring retainer washer.

h. If gap is unacceptable, turn off power to flexible borescope light source; then remove thermocouple. Refer to paragraph 3.

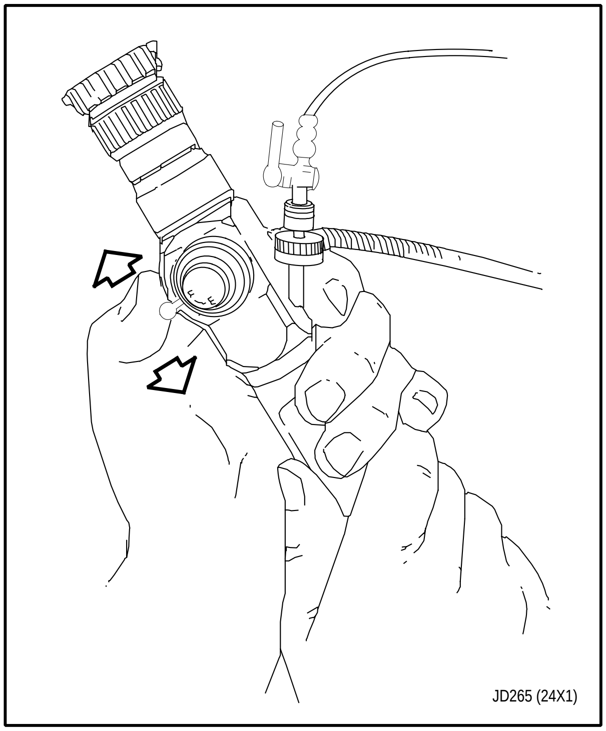


Figure 11. Operation of Flexible Borescope (Sheet 3 of 3)

i. Inspect thermocouple as follows:

(1) Measure diameter of thermocouple probe in area B described in figure 12.

(2) If measured diameter is more than 0.095 inch, replace thermocouple.

(3) Thermocouples measuring 0.095 inch or less are acceptable.

j. Install thermocouple. Refer to paragraph 7.

k. Repeat thermocouple seating check as follows:

(1) Turn fiber optics light source rotary switch to position 1.

(2) Focus on washer and turbine case boss. Adjust light intensity to desired level.

l. Determine gap measurement for acceptability. Refer to step g.

m. Inspect other thermocouples for proper seating.

n. Turn light source power off.

o. Remove flexible borescope and guide tube.

p. Disconnect fiber optics light source power cord from power outlet.

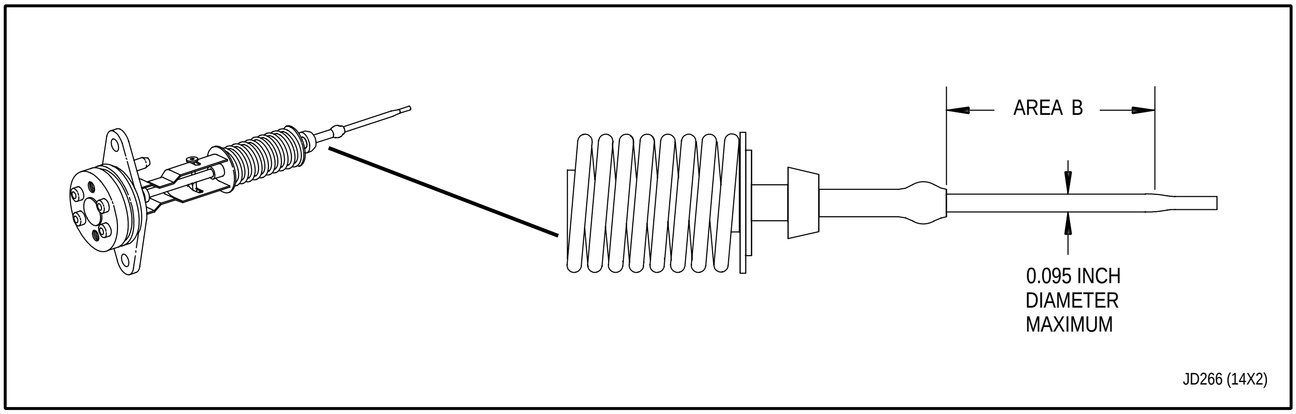


Figure 12. FTIT Sensing Immersion Thermocouple - Diameter Inspection

9. FTIT SENSING IMMERSION THERMOCOUPLE - INSTALLATION USING PWA 55422 FIXTURE.
(See Figure 13.)

NOTE

Seating verification is not required when PWA 55422 fixture is used.

a. Loosen screw to let PWA 55422 fixture adjust to its natural length. (See figure 13, Sheet 1.)

b. Turn knob until rod is flush with housing.

c. Insert fixture through boss. (See figure 13, Sheet 2.)

d. When plate is flush to boss, push knob in until it stops.

e. Tighten screw.

f. Remove fixture.

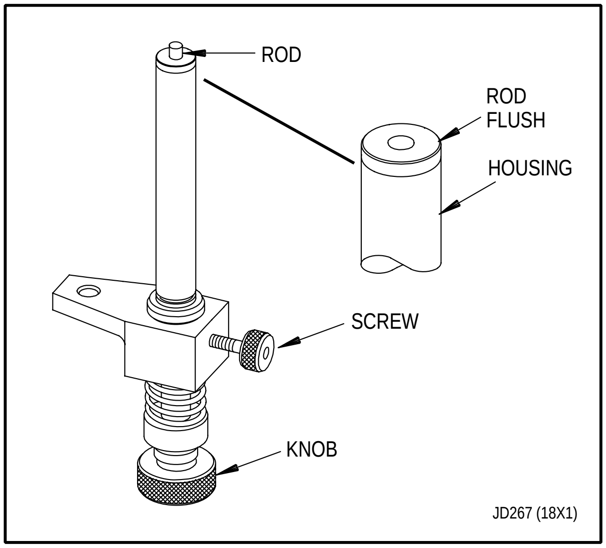


Figure 13. FTIT Sensing Immersion Thermocouple - Installation Using PWA 55422 Fixture (Sheet 1 of 8)

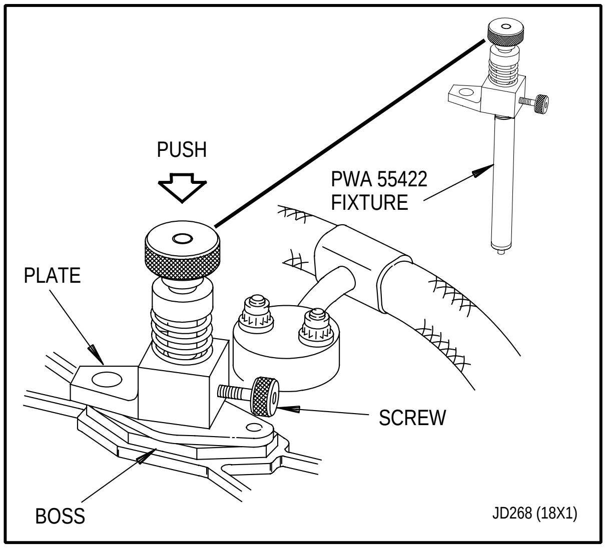


Figure 13. FTIT Sensing Immersion Thermocouple - Installation Using PWA 55422 Fixture (Sheet 2 of 8)

g. Insert thermocouple into PWA 55422 fixture. See figure 13, sheet 3.

h. Adjust rod flush with outboard surface of flange by turning knob.

i. Lock rod in position by tightening nut.

j. Remove thermocouple from fixture.

k. Apply PWA 550 antigalling compound to threads of studs. See figure 13, sheet 4.

CAUTION

Ensure dowel pin is seated in pin hole in mounting boss to avoid damaging thermocouple.

k1. Apply a smooth coat of Milk of Magnesia to tip of thermocouple probe and let dry.

l. Insert thermocouple into engine with locating pin in hole.

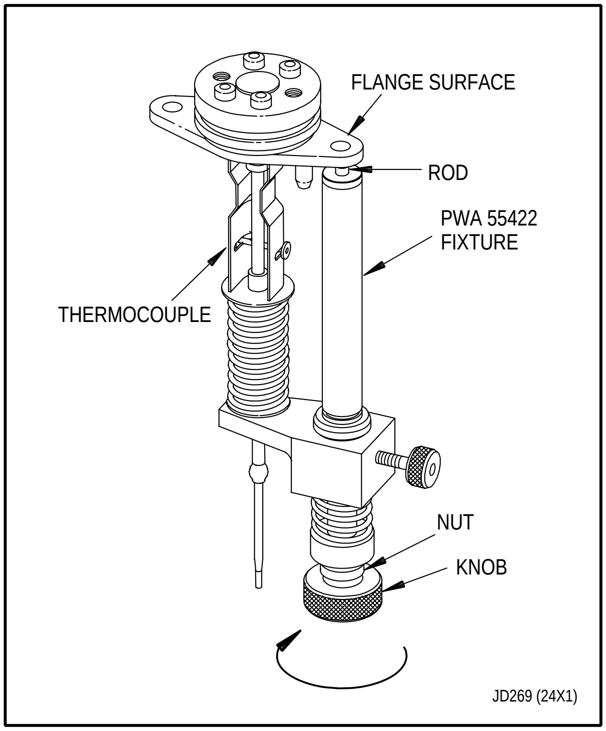


Figure 13. FTIT Sensing Immersion Thermocouple - Installation Using PWA 55422 Fixture (Sheet 3 of 8)

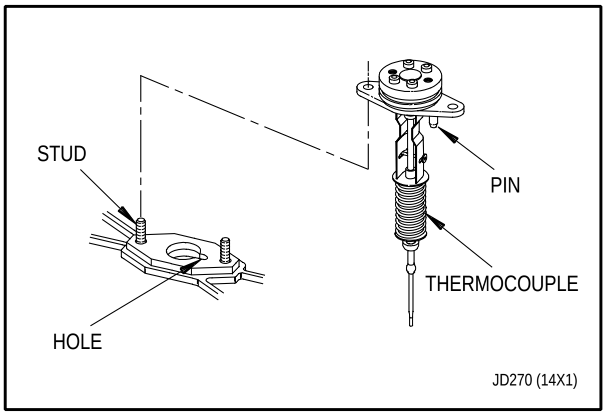


Figure 13. FTIT Sensing Immersion Thermocouple - Installation Using PWA 55422 Fixture (Sheet 4 of 8)

m. Place PWA 55422 housing flush with flange. (See figure 13, Sheet 5.)

n. Check gap between end of rod and rear fan duct. Thermocouple is properly seated with a gap of 0.030 inch or less. Repeat steps l, m, and n for gaps greater than 0.030 inch.

o. Install nuts on studs. (See figure 13, Sheet 6.) Torque nuts 23 to 26 pound-inches.

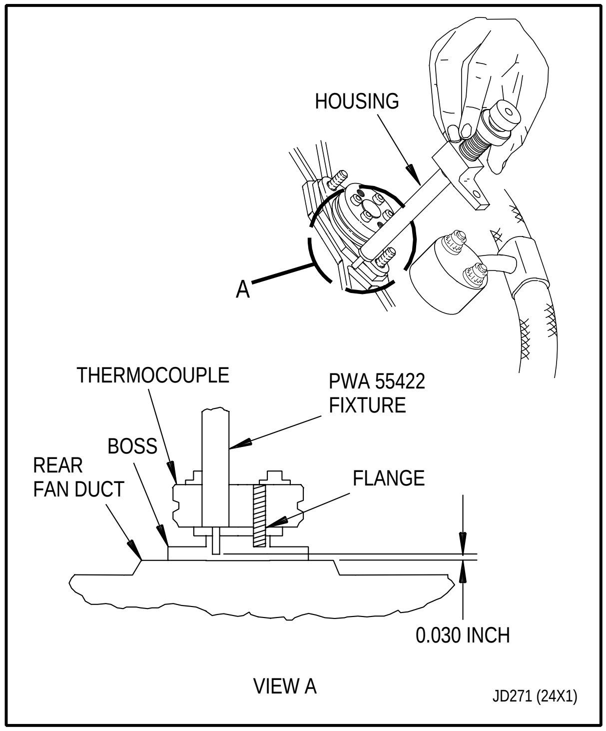


Figure 13. FTIT Sensing Immersion Thermocouple - Installation Using PWA 55422 Fixture (Sheet 5 of 8)

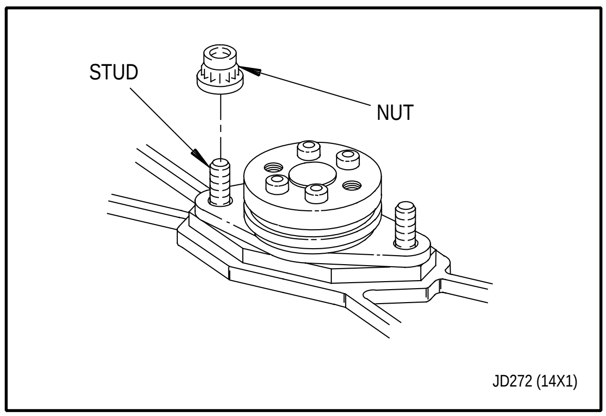


Figure 13. FTIT Sensing Immersion Thermocouple - Installation Using PWA 55422 Fixture (Sheet 6 of 8)

p. Wipe off excess lubricant from packing and thermocouple ensuring cable contacts are clean.

q. Apply a light coat of VV-P-236 petrolatum to PN MS9386-122 packing, and install on thermocouple. (See figure 13, Sheet 7.)

r. Install cable connectors P38 through P44 to thermocouples as follows:

(1) Inspect cable cap bolt threads for damage and debris. Replace/clean as required.

(2) Apply PWA 550 anti-galling compound to cable cap bolt threads if none is present.

CAUTION

Ensure there is no anti-gallant on contacts of thermocouples or cable probe caps. To avoid electrical short circuit.

(3) Install cable cap bolts fingertight until bolts bottom on cable cap. If bolts bind, remove bolts and chase insert threads using 10-32-UNJF-3B tap. Clean threads as required.

(4) Reinstall cable cap bolts fingertight until bolts bottom on cable cap. Torque bolts 10 to 15 pound-inches. Lockwire with MS9226-04 wire.

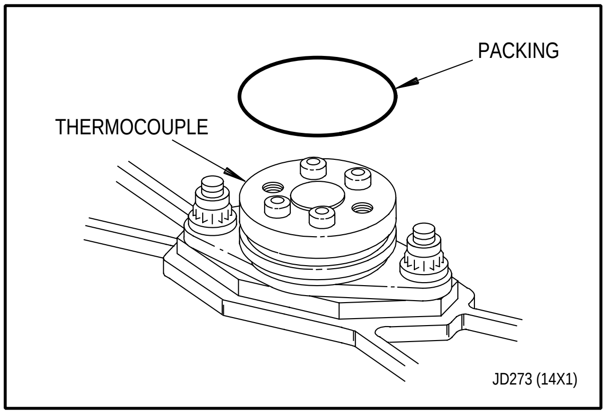


Figure 13. FTIT Sensing Immersion Thermocouple - Installation Using PWA 55422 Fixture (Sheet 7 of 8)

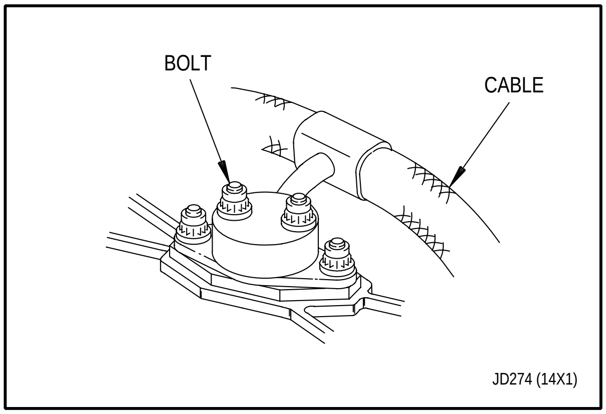


Figure 13. FTIT Sensing Immersion Thermocouple - Installation Using PWA 55422 Fixture (Sheet 8 of 8)

10. FTIT SENSING IMMERSION THERMOCOUPLE - STORAGE AND SHIPMENT.

a. Clean thermocouple with a lint-free cloth moistened with denatured alcohol.

b. Dry with clean compressed air at less than 30 psig.

c. Store thermocouple in a protective container.

d. If thermocouple is to be shipped, pack in a container with shock absorbent material.

WORK PACKAGE

TECHNICAL PROCEDURES

CONTROL - FUEL, MAIN

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 70

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	21	11	16	23 - 27	0
2	16	12	0	28	21
2A	21	13 - 14	15	29 - 58	0
2B Blank	4	15 - 18	16	59	2
3	21	19	0	60 - 63	0
4 - 8	16	20 - 22	16	64 - 68	21
9 - 10	0				

REFERENCE MATERIAL REQUIRED

Title	Number
Engine Test	T.O. 2J-F100-11-2
Engine Test Requirements	WP 206 00
Engine Leak Check and Gaspath Inspection	WP 302 00
Engine Accessories and Rigging Procedures	T.O. 2J-F100-53-4
Control Push-pull, Rear Compressor Variable Vane, Feedback - Rigging	WP 102 00
Hydraulic Pressure Tester PWA 50096	T.O. 33D4-6-617-1

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Alcohol, denatured	O-E-760, Type III
or	
Trichloroethane inhibitor - 1,1,1	O-T-620
Cloth, lint-free	-
Compound, antigalling (PWA 550)	Hi-T-650 or Lubri-Bond HT
Lockwire (0.016 inch diameter)	MS9226-01
Lockwire (0.025 inch diameter)	MS9226-03
Lockwire (0.032 inch diameter)	MS9226-04
Oil, lubricating	MIL-L-6081, Grade 1005 or 1010
Oil, lubricating	MIL-L-7808
Petrolatum	VV-P-236
Solvent, petroleum	P-D-680, Type II

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Packing, preformed	MS9966-04	4
Packing, preformed	MS9966-06	5
Packing, preformed	MS9966-010	2
Packing, preformed	MS9967-214	1
Packing, preformed	2563702-16	1
Packing, preformed	2666850-10	1
Packing, preformed	2666850-11	3
Packing, preformed	2666850-12	4
Packing, preformed	2666850-23	1
Packing, preformed	2666850-26	1
Packing, preformed	2666850-27	1
Packing, preformed	2666850-136	1
Packing, preformed	2666850-140	1
Packing, preformed	2666850-145	1
Packing, preformed	2667998-15	1
Packing, preformed	2667998-17	1
Packing, preformed	2667999-8	1
Packing, preformed	2670890-8	1
Packing, preformed	2670890-10	1
Packing, preformed	2670890-20	1

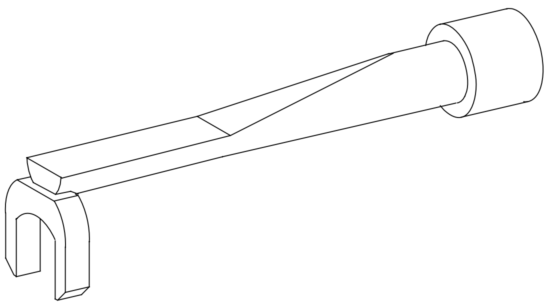
APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
2,8	Main Fuel Control - Removal and Installation	
	Torque adapter - gas generator control hose, local manufacture -----------------	LM 1012
10	Ignition Switch Wiring Harness Assembly - Replacement	
	Ohmmeter (NSN 6625-00-643-1686) or equivalent ---------------------	PSM-6
15	PLA Resolver and Cover Assembly - Replacement	
	Adapter - Hex wrench --------------	2552146 (Allied Signal) or equivalent

APPLICABLE SUPPORT EQUIPMENT (Continued)

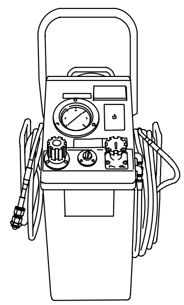
Paragraph	Function - Tool Nomenclature	Tool Number
17	Main Fuel Control - Leak Check/Preservation	
	Adapter Kit, Oil Flush Test -----------	2563702 (Allied Signal)
	Adapter, PF2 Inlet -----------------	2563752 (Allied Signal)
	Test - Hydraulic Pressure -----------	PWA 50096
	Kit, Closure ----------------------	3509938 (Allied Signal)

ILLUSTRATED SUPPORT EQUIPMENT



LM 1012 –C

Figure T1. LM 1012 Adapter



PWA 50096 –C

Figure T1A. PWA 50096 Hydraulic Pressure Tester

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures for the main fuel control (MFC):

- Removal
- Removal of attaching parts
- Cleaning
- Inspection
- Inspection of attaching parts
- Installation of attaching parts
- Installation
- Mode solenoid harness and screen assembly - Replacement
- Ignition switch wiring harness assembly - Replacement
- Metering valve electro-hydraulic servo valve (EHV) - Replacement
- Rear compressor variable vane (RCVV) EHV - Replacement
- Start bleed solenoid valve and screen assembly - Replacement
- Metering valve resolver and housing assembly - Replacement
- PLA resolver and cover assembly - Replacement
- Tt2 sensor assembly - Replacement
- Leak check
- Storage and shipment

2. MAIN FUEL CONTROL - REMOVAL.

(See Figures 1 through 4.)

a. Disconnect electrical connectors, P107, P108, P109, P110, P111, P112, and P113 from MFC. (See figure 1.) Install protective closures on receptacles.

b. Remove bolts, nuts, and clamps securing probe capillary tube to engine. Remove four bolts securing Tt2 sensing probe to fan inlet case. Remove probe from fan inlet case. Carefully remove capillary tube probe.

c. Coil capillary tube probe and temporarily secure. Do not twist tube or gather probe capillary tube into a coil of less than 6 inches in diameter. Keep orange stripe straight or damage to probe capillary tube can occur.

d. Place a container under control to catch fuel, as tubes and manifolds are disconnected.

e. Remove tubes and hoses as follows (see figure 2):

(1) Remove hose assembly (PF1 RET)(13).

(2) Remove bolts(6), and slowly disconnect hose assembly (PF4)(5) from control to ensure residual pressure is relieved. Discard packing(4).

(3) Remove bolts(11), and disconnect hose assembly(10) from tube connector(19). Discard packing(12).

(4) Disconnect tube assembly(14) from tube connector(19).

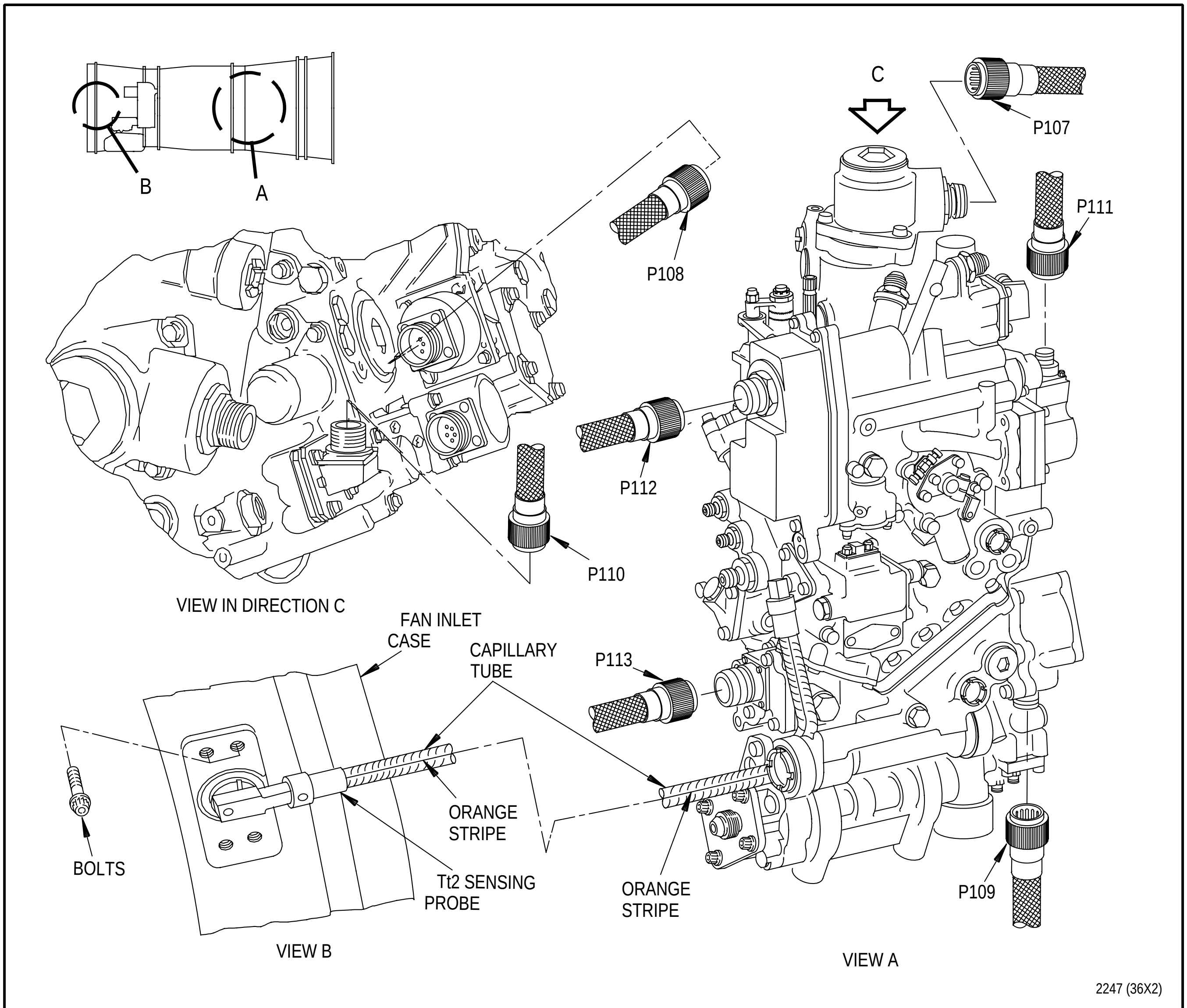


Figure 1. Main Fuel Control - Disconnect Electrical Connectors

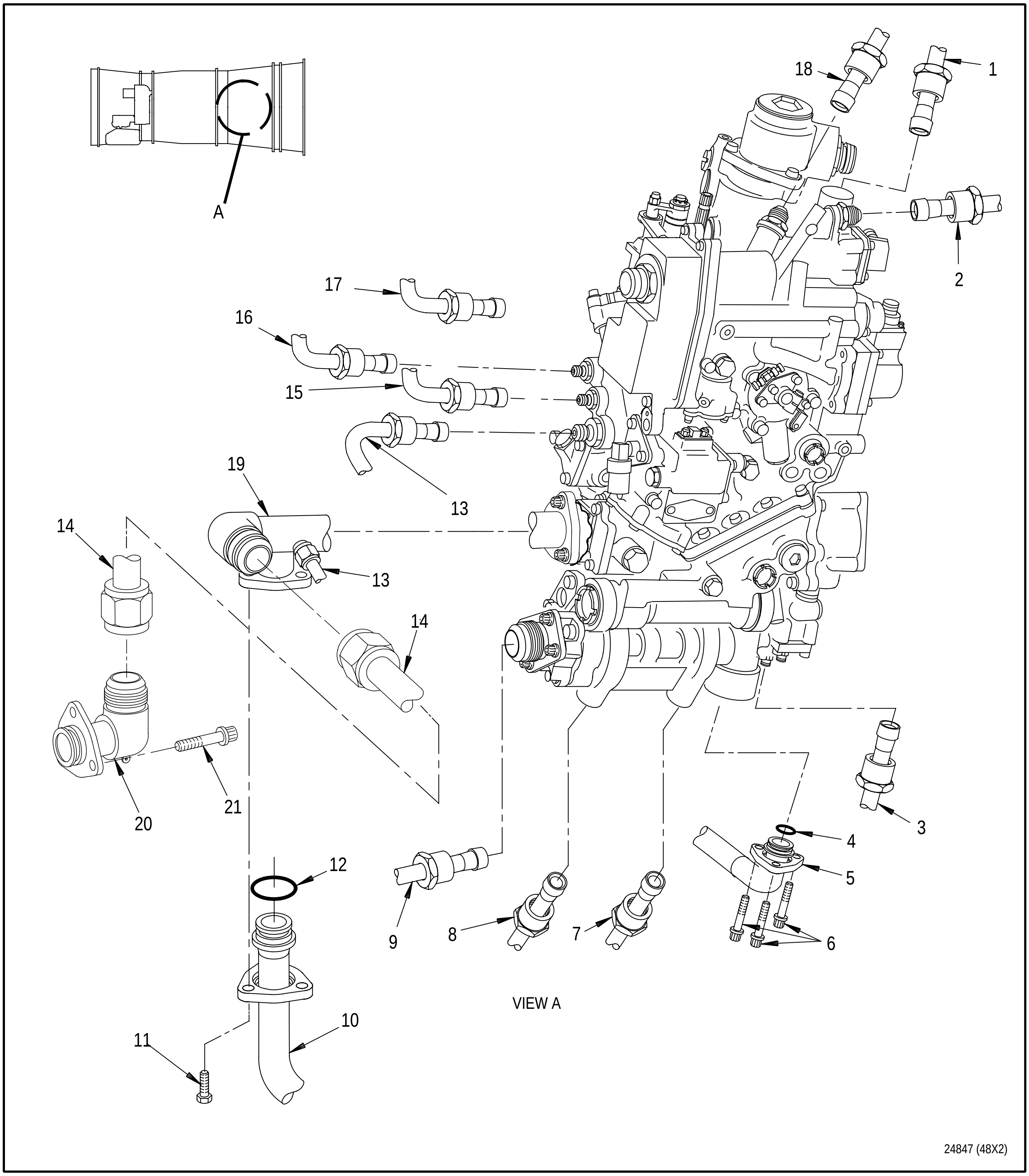


Figure 2.   Main Fuel Control - Disconnect Tubes and Hose Assemblies

Legend for Figure 2

1. Gas generator control Ps2 hose assembly
2. Main fuel control PFMO manifold
3. Hose assembly (PFSIM)
4. Packing
5. Hose assembly (PF4)
6. Bolts
7. Hose assembly (PFS1)
8. Hose assembly (PF2F)
9. Hose assembly (PF2 fuel inlet)
10. Hose assembly
11. Bolt
12. Packing
13. Hose assembly (PF1 RET)
14. Tube assembly
15. Start bleed tube assembly (PFCBC)
16. Gas generator control to start bleed tube assembly (PFCBO)
17. Hose assembly (PFEXT)
18. Hose assembly (PFRET)
19. Tube connector
20. Tube elbow
21. Bolt

f. Deleted.

g. Disconnect Ps2 hose coupling nut (1, figure 2) using LM 1012 Adapter.

h. Disconnect remaining tubes and hose assemblies from control.(See figure 2.)

CAUTION

Lever on MFC is spring-loaded and will retract when RCVV feedback push-pull control is disconnected from it. Lever shall be restrained to retract slowly or damage to lever stop may occur.

i. Remove bolt(1, figure 3).

NOTE

An Allen wrench may be inserted in feedback shaft to restrain lever while performing step l.

j. Restrain lever on MFC, and remove bracket(2) securing rod end(3) on control.

k. Loosen bolt(4) and remove rod end(3) from push-pull control(5).

l. Install bracket(2) and bolt(1) on control lever.

m. Do not bend end of RCVV feedback push-pull control more than 6 degrees maximum from control axis. Seal and support tube details will become disengaged from conduit end cap.

n. Hold hex(6) on push-pull control and remove sleeve nut(7) and washer(8) from control. Withdraw push-pull control from lug(9) on MFC. Remove washer(10).

o. Support MFC, and disconnect MFC forward mount from connecting link, leaving connecting link attached to engine. (See figure 4.)

p. Support MFC while removing bolts and nuts that secure control to brackets on rear fan duct and link on Flange G. Remove MFC.

q. Remove transfer tube(15, figure 2) from main fuel pump and discard packing(22).

Pages 8A through 8D blank including Figures 2A and 2B are deleted.

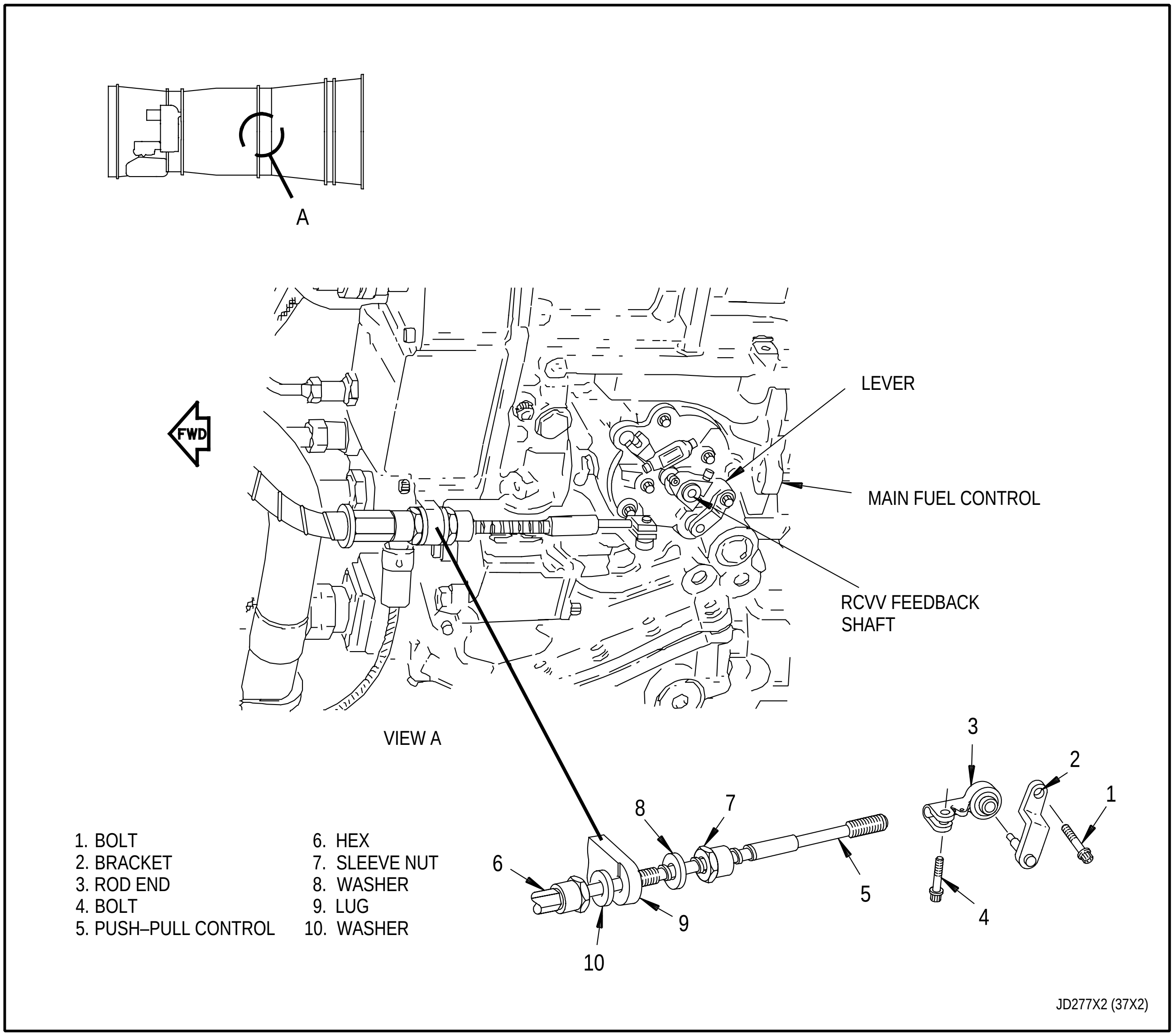


Figure 3. Main Fuel Control - Removal of Rear Compressor Variable Vane Feedback Push-pull Control

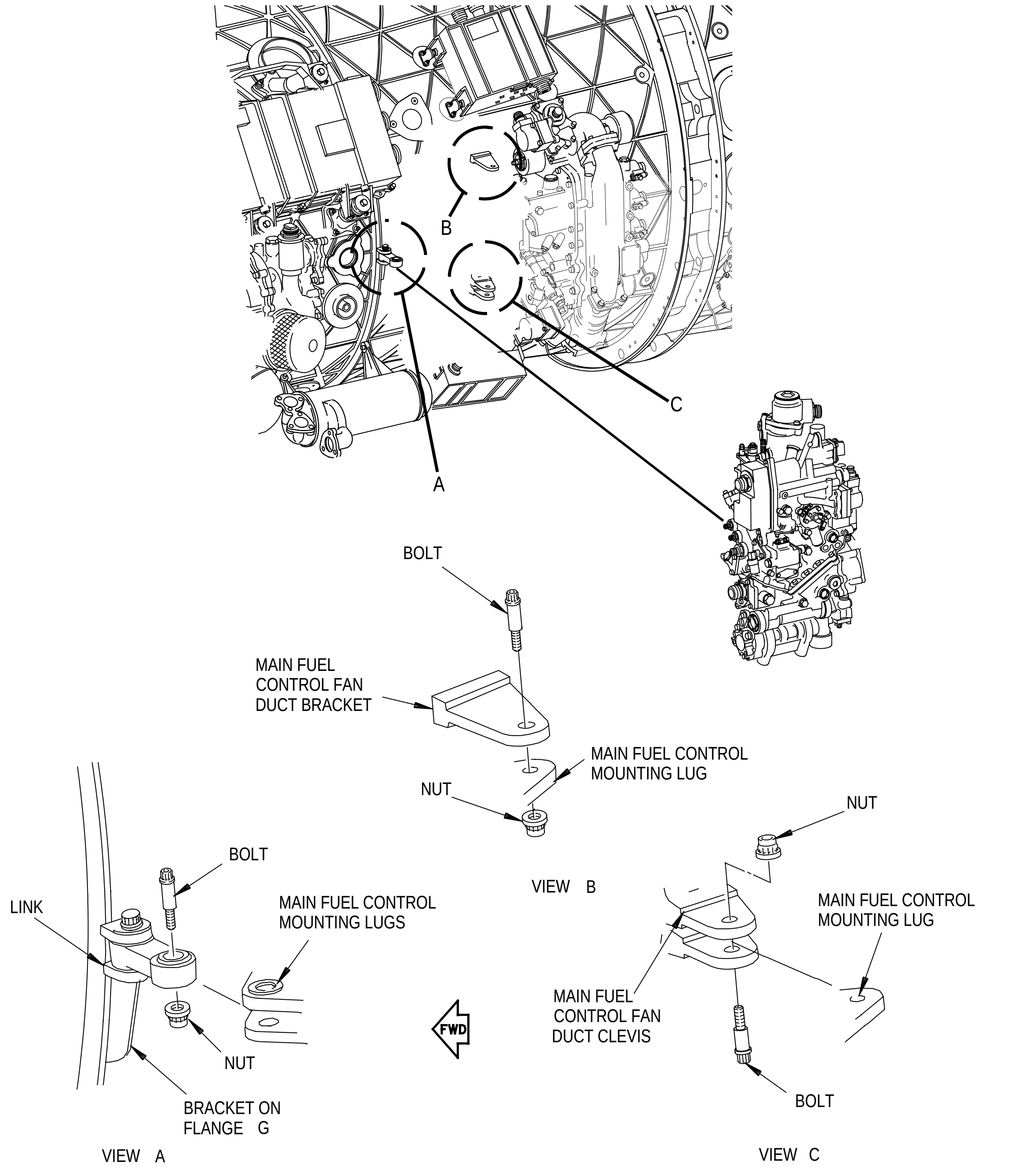


Figure 4. Main Fuel Control - Removal

3. MAIN FUEL CONTROL - REMOVAL OF ATTACHING PARTS.
(See Figure 5.)

a. Remove adapters(1, figure 5) from MFC. Remove and discard packings(2).

b. Remove bolts(3) and tube connector(4) from control. Remove and discard packing(5).

c. Remove bolts(6) and straight adapter(7) from control. Remove and discard packing(8).

d. Cap all ports with protective closures.

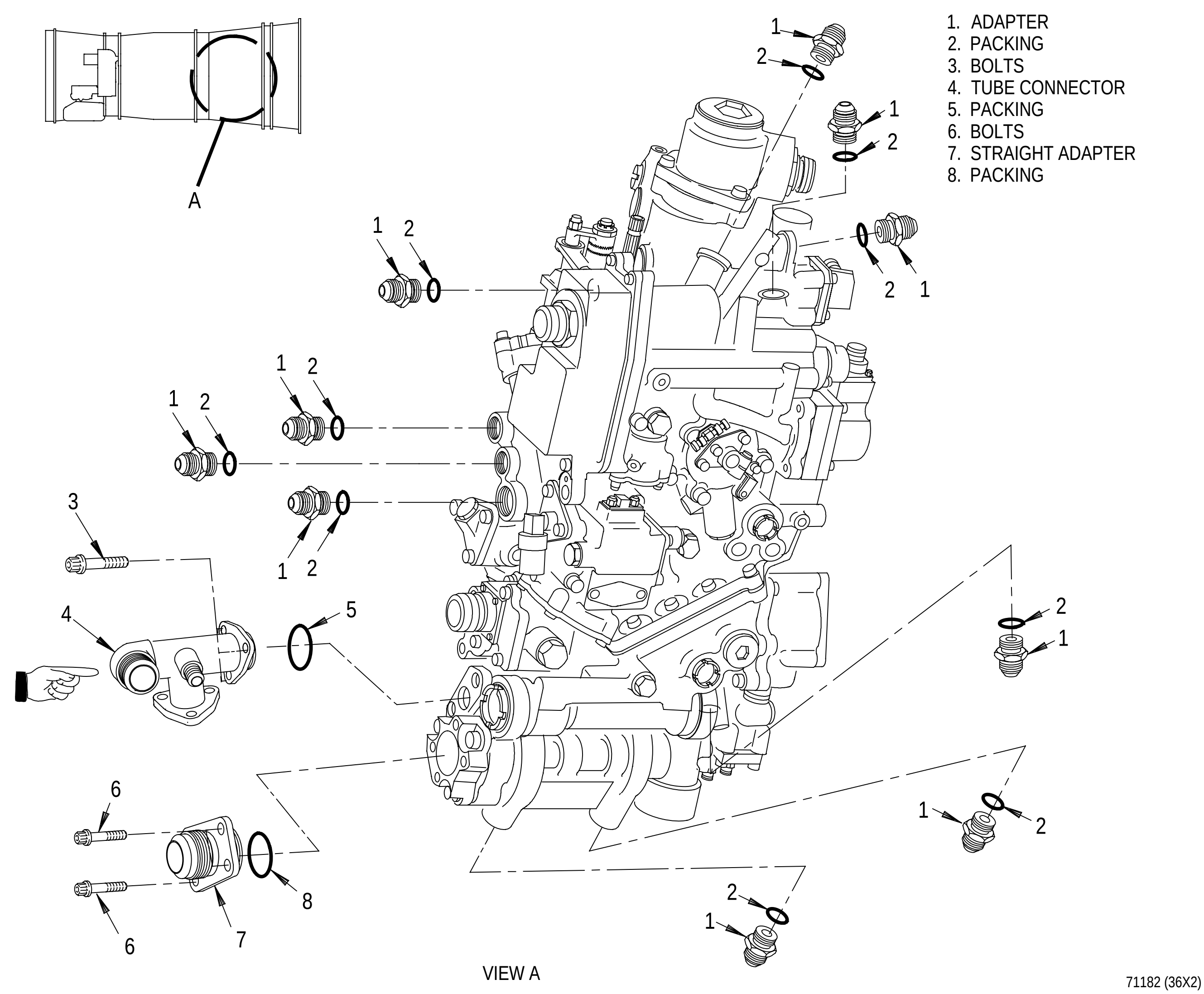


Figure 5. Main Fuel Control - Removal of Attaching Parts

4. MAIN FUEL CONTROL - CLEANING.

a. Wipe exterior of MFC with a clean cloth moistened with P-D-680, Type II petroleum solvent.

b. Wipe control dry with clean, dry lint-free cloth.

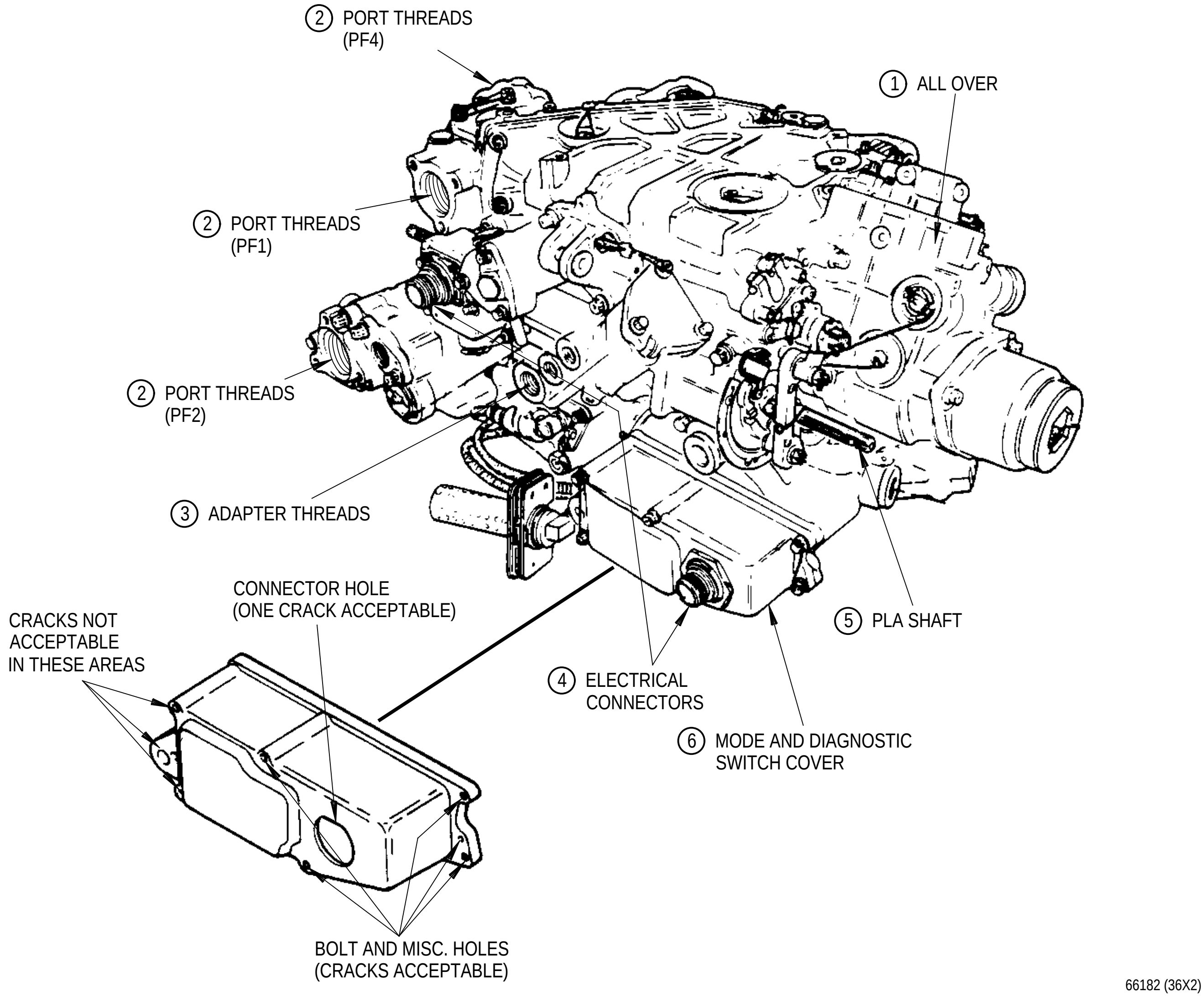
c. Clean electrical connectors, pins, and sockets with O-E-760, Type III alcohol or Trichloroethane inhibitor - 1,1,1 O-T-620.

d. Dry with clean compressed air at less than 30 psig.

5. MAIN FUEL CONTROL - INSPECTION.

(See Figure 6.)

a. Inspect MFC. (See figure 6.)



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. All over -			
Wear, corrosion, cracks, dents, or leakage	Not serviceable	Not reparable	Replace control.
2. PF1, PF2, and PF4 Port threads -			
Threads stripped, crossed, or insert pulled out of casting	Not serviceable	Not reparable	Replace control.

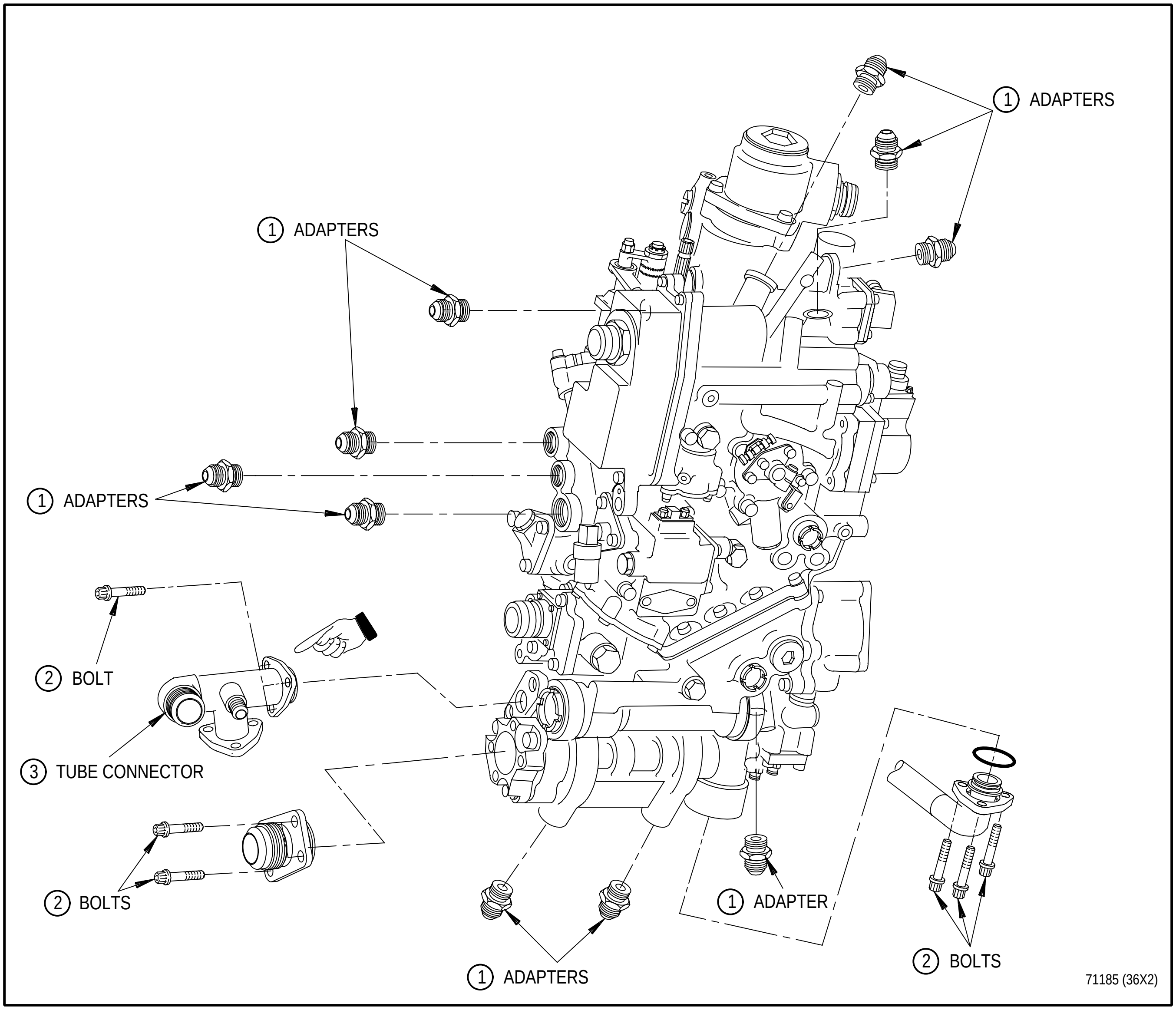
Figure 6. Main Fuel Control - Inspection

Legend for figure 6 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
3. Adapter threads -			
Threads stripped, crossed, or missing	Not serviceable	See corrective action.	Repair minor thread damage using thread chaser, tap, or die.
4. Electrical connectors -			
Threads stripped, damaged, or missing	Not serviceable	Not reparable	Replace module or control as applicable.
Pins bent, or corroded	Not serviceable	Not reparable	Replace module or control as applicable.
5. PLA shaft -			
Bent, deformed	Not serviceable	Not reparable	Replace main fuel control.
6. Mode and diagnostic switch cover -			
Cracks	Visual cracks emanating from connector hole or bolt holes are acceptable if not more than one inch long. Cracks are not acceptable in RCVV feedback cable support area.	Not reparable	Replace main fuel control.
Chips	Chips acceptable if no thru-holes result in cover and chips do not exceed 0.250 inch in diameter.	Not reparable	Replace main fuel control.
External surface	Cosmetic features such as blemishes and flow lines, resulting from molding process, are acceptable.	Not reparable	Replace main fuel control.

6. MAIN FUEL CONTROL - INSPECTION OF ATTACHING PARTS.
(See Figure 7.)

a. Inspect attaching parts of MFC.
(See figure 7.)



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Adapters -			
Threads stripped or damaged	Not serviceable	Not reparable	Replace adapter.
Sealing surfaces scratched or dented	Not serviceable	Not reparable	Replace adapter.

Figure 7. Main Fuel Control - Inspection of Attaching Parts

Legend for figure 7 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
2. Bolts -			
Threads stripped or damaged	Not serviceable	Not reparable	Replace bolt.
3. Tube connector -			
Sealing surfaces scratched or dented	Not serviceable	Not reparable	Replace tube connector.

7. MAIN FUEL CONTROL - INSTALLATION OF ATTACHING PARTS.
(See Figure 8.)

a. Lubricate preformed packings with MIL-L-7808 oil or VV-P-236 petrolatum. (See figure 8.)

NOTE

Position tube connector(7, figure 8) so that PF1 RET port points towards PF2 port.

b. Lubricate threads of adapters with MIL-L-7808 oil, and install attaching parts to MFC. (See figure 8.)

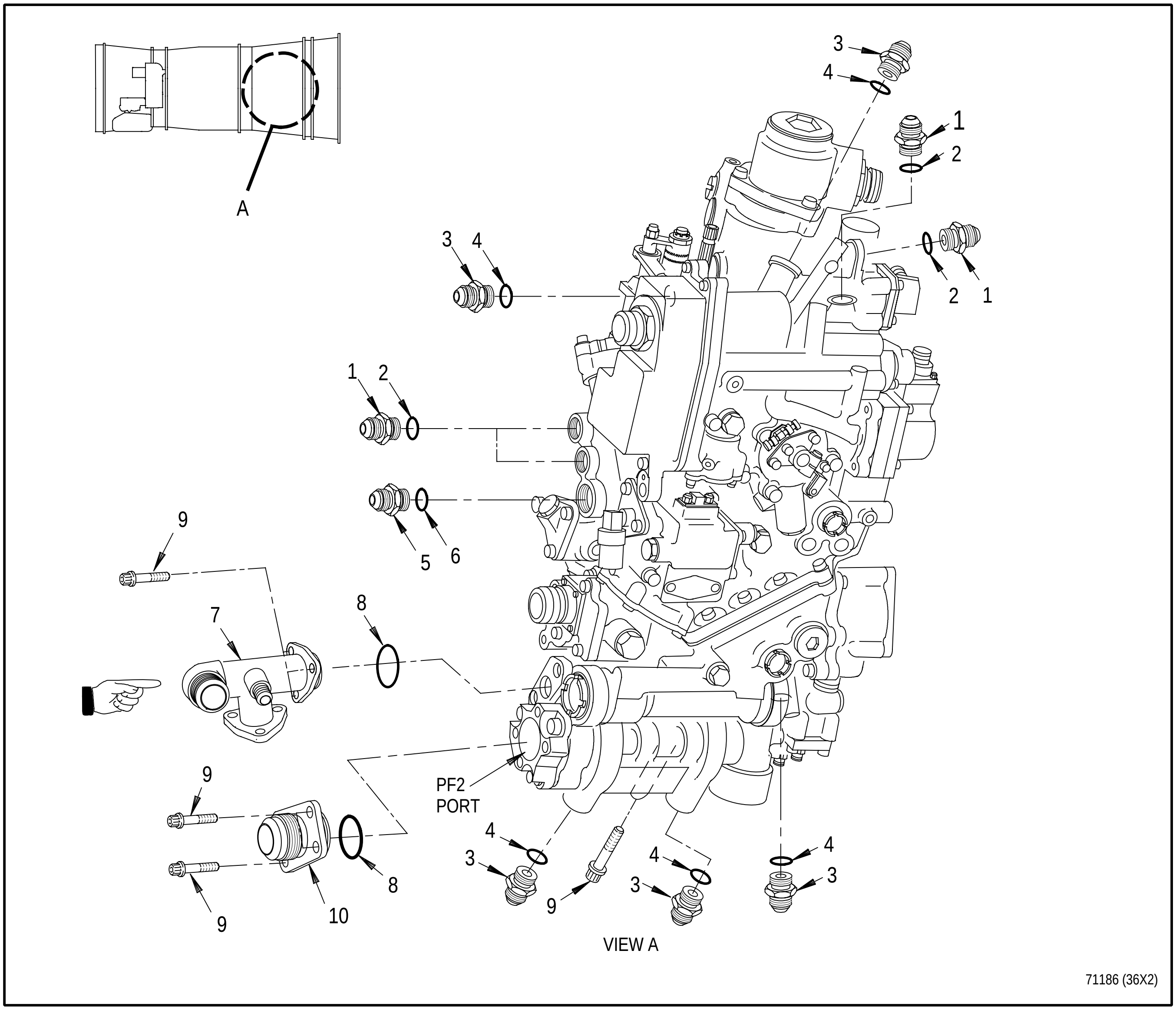


Figure 8. Main Fuel Control - Installation of Attaching Parts

Legend for figure 8

Index No.	Description	Lubrication	Torque(Lb-In.)
1.	Adapter PN ST2000-04	Oil	65 to 75
2.	Packing PN MS9966-04	Oil or Petrolatum	-
3.	Adapter PN ST2000-06	Oil	110 to 120
4.	Packing PN MS9966-06	Oil or Petrolatum	-
5.	Adapter PN ST2091-062	Oil	200 to 225
6.	Packing PN MS9967-018	Oil or Petrolatum	-
7.	Tube Connector PN 4060492	-	-
8.	Packing PN MS9967-214	Oil or Petrolatum	-
9.	Bolts - 10 Required PN ST1420-08	PWA 550	62 to 72
10.	Straight Adapter PN 4068090	-	-

8. MAIN FUEL CONTROL - INSTALLATION.
(See Figures 9 through 13.)

a. Install main fuel control as follows:

(1) Apply PWA 550 antigalling compound to threads of mounting bolts. Remove excess.

(2) Position MFC mounting lugs to brackets on rear fan duct and link attached to bracket on Flange G. (See figure 9.)

(3) Install bolts and nuts to brackets and rear mounting lugs. Torque nuts 62 to 72 pound-inches. (See figure 9.)

(4) Install bolt and nut to lugs and front mounting link. Torque nut 27 to 30 pound-inches.

(5) Coat packings(4 and 12) with MIL-L-7808 oil or VV-P-236 petrolatum.

b. Deleted.

c. Install packing(4) and secure hose assembly(5) with bolts(6) to control. Torque bolts.

d. Install packing(12), secure hose assembly(10) to tube connector(19, figure 10) using bolts(11). Torque bolts.

e. Connect hose coupling nut (1, figure 10) to MFC using LM 1012 Adapter. Torque nut per figure 10.

f. Connect tubes and manifolds to MFC (see figure 10). Torque tube and hose coupling nuts.

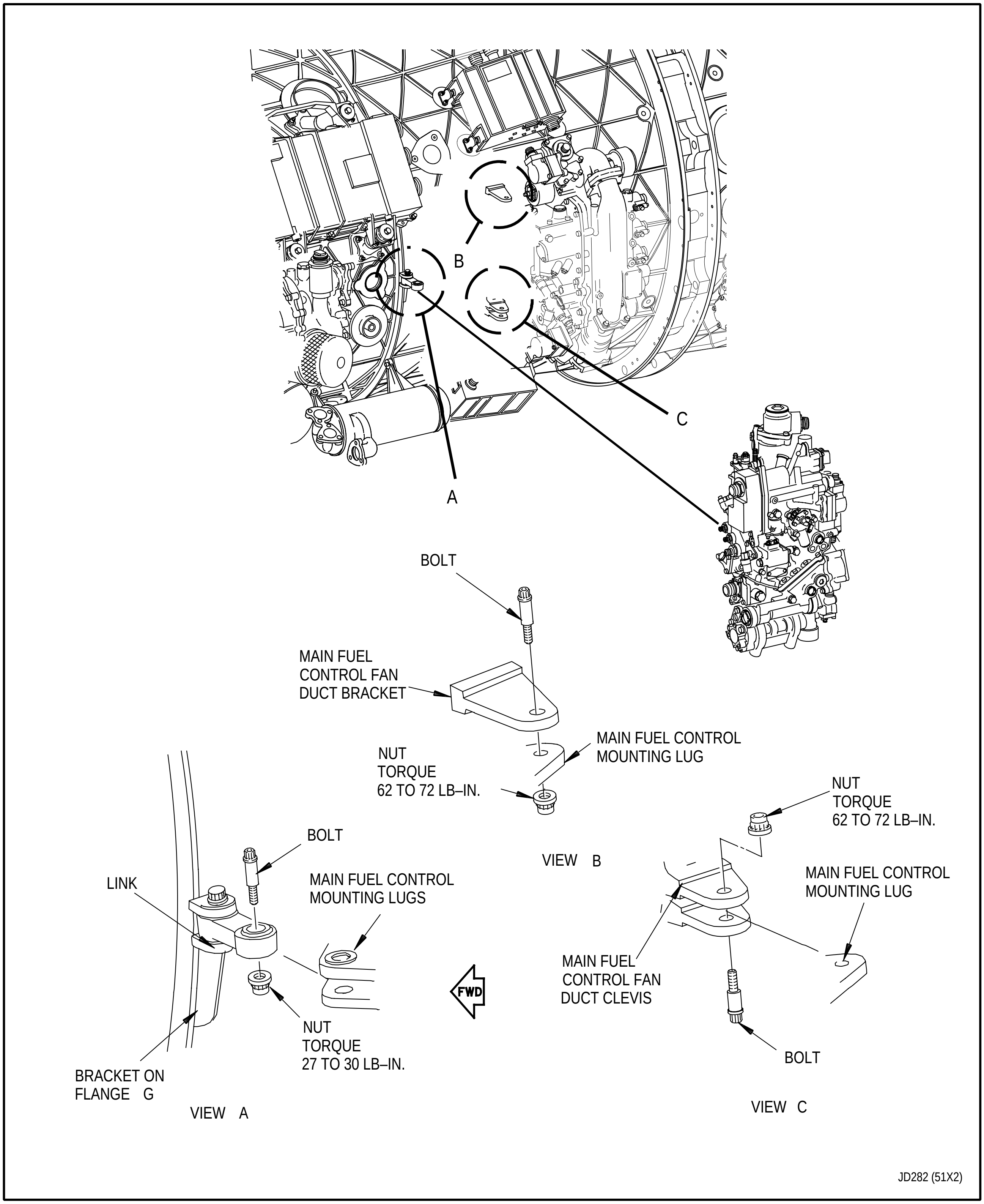


Figure 9. Main Fuel Control - Installation

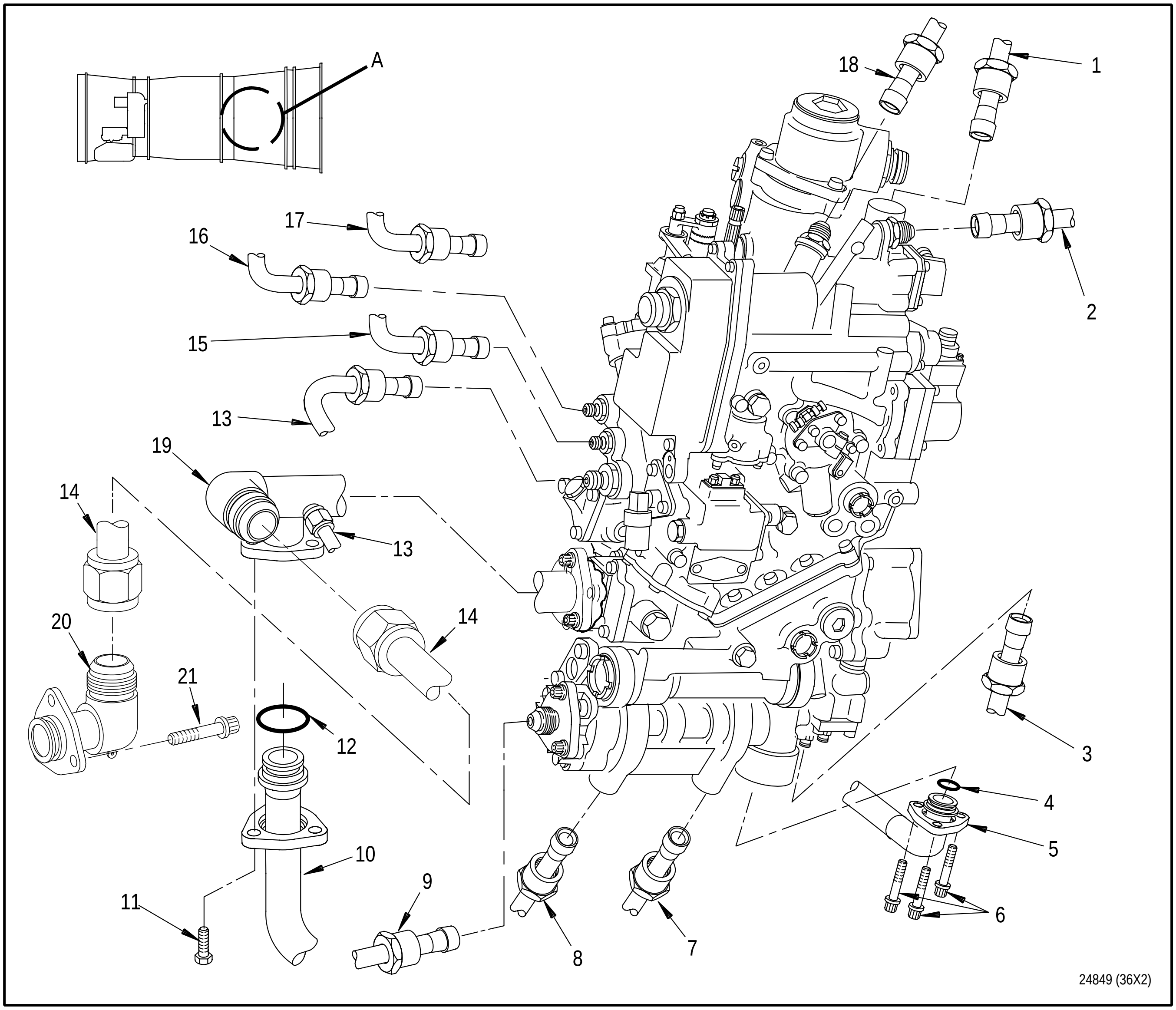


Figure 10. Main Fuel Control - Installation of Tubes and Manifolds

Legend for figure 10

Index Number	Description	Lubrication	Torque (lb-in.)
1.	Hose coupling nut	PWA 550	65 to 75
2.	Tube coupling nut	PWA 550	65 to 75
3.	Hose coupling nut	PWA 550	200 to 225
4.	PN MS9966-010 packing	Oil or Petrolatum	-
5.	Hose assembly	-	-
6.	Bolts	PWA 550	62 to 72
7.	Hose coupling nut	PWA 550	200 to 225
8.	Hose coupling nut	PWA 550	200 to 225
9.	Hose coupling nut	PWA 550	675 to 750
10.	Hose assembly	-	-
11.	Bolts	PWA 550	23 to 26
12.	PN MS9966-010 packing	Oil or Petrolatum	-
13.	Hose coupling nut	PWA 550	200 to 235
14.	Tube assembly nut	-	950 to 1050
15.	Tube coupling nut	PWA 550	65 to 75
16.	Tube coupling nut	PWA 550	65 to 75
17.	Hose coupling nut	PWA 550	200 to 225
18.	Hose coupling nut	PWA 550	200 to 225
19.	Tube connector	-	-
20.	Tube elbow	-	-
21.	Bolt	Oil	62 to 72

g. When installing Tt2 sensing probe, do not bend capillary tube less than a 6 inch diameter. Do not twist capillary tube. Keep orange stripe straight or damage to capillary tube probe can occur.

h. Secure Tt2 sensing probe(1) to fan inlet case(2) with bolts(3). Torque bolts 27 to 30 pound-inches. (See figure 11.) Lockwire bolts with PN MS9226-04 wire.

   (1) Secure capillary tube probe to engine with bolts, clamps, and nuts. (See figure 12.) Torque nuts 27 to 30 pound-inches.

i. Connect electrical connectors P107, P108, P109, P110, P111, P112, and P113 to mating receptacles of MFC as follows:

   (1) Align keyways and handtighten connector.

   (2) Ensure red line on receptacle is not visible when viewed at right angles.

   (3) Tighten connector firmly with soft-jawed pliers.

CAUTION

RCVV push-pull control cable is spring loaded. Hold cable when disconnecting and allow to retract slowly to avoid damage to main fuel control lever stop.

j. Remove bolt(1, figure 13) and bracket(2) from lever(3) on control.

k. Apply a light coat of PWA 550 antigalling compound to threads(4) of RCVV feedback push-pull control.

l. Install nut(5) onto double-threaded end of push-pull control, and turn nut to stop. Install washer(6).

m. Insert end of push-pull control through fuel control mounting lug(7). Install washer(8) and nut(9). Leave nut loose.

n. Turn rod end(10) onto push-pull control until threaded end of control is two turns beyond slot in rod end. Lock rod end with bolt(11), and torque 14 to 19 pound-inches. Lockwire bolt with PN MS9226-04 wire.

o. Attach rod end(10) to lever(3) as follows:

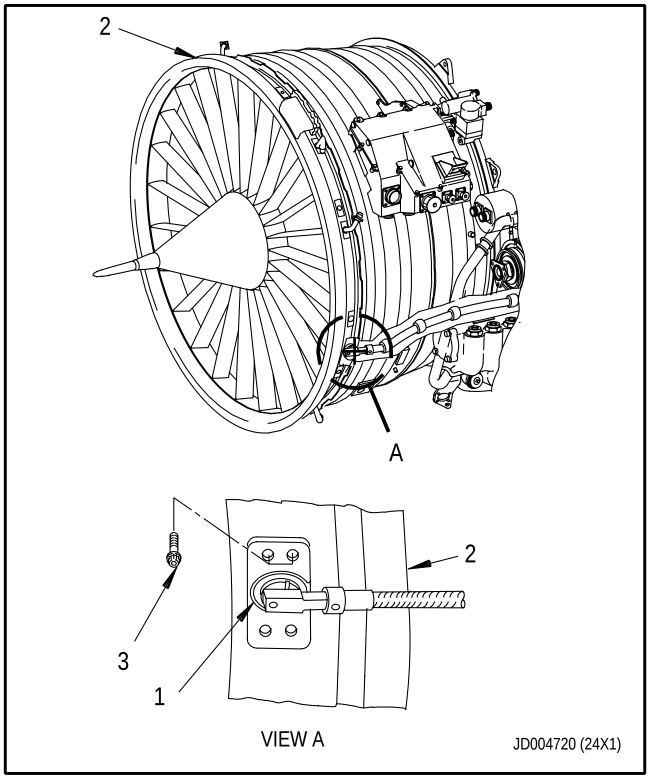
   (1) Rotate lever(3) until hole in lever is aligned with rod end(10).

   (2) Install bracket(2) through rod end(10) and lever(3).

   (3) Secure bracket(2) with bolt(1). Torque bolt 8 to 9 pound-inches.

p. Rig push-pull control. Refer to WP 102 00.

Pages 22A andd 22B including Figure 10A are deleted.



1. Tt2 sensing probe
2. Fan inlet case
3. Bolt

Figure 11. Main Fuel Control - Tt2 Sensing Probe Installation

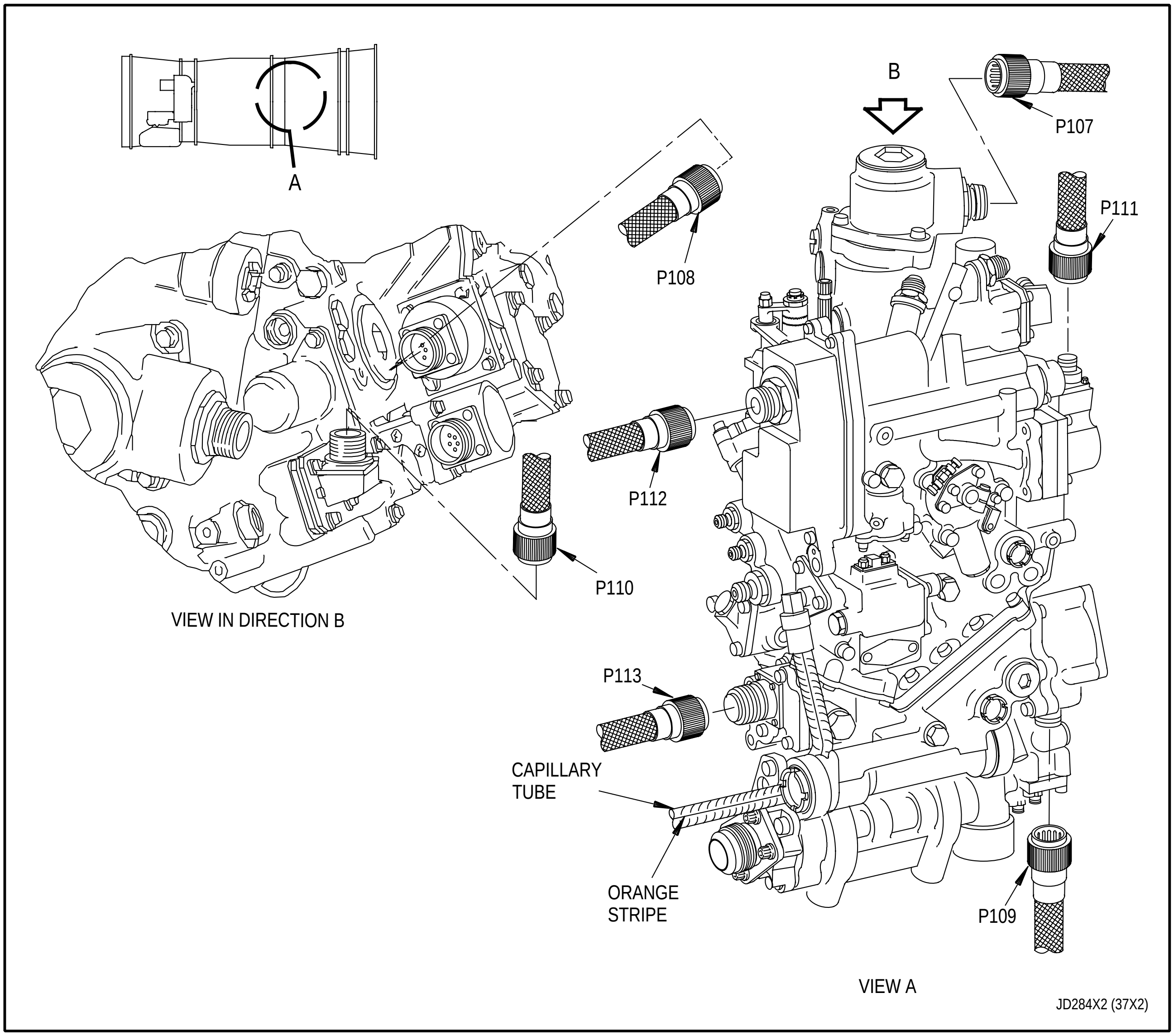


Figure 12. Main Fuel Control - Connect Electrical Connectors

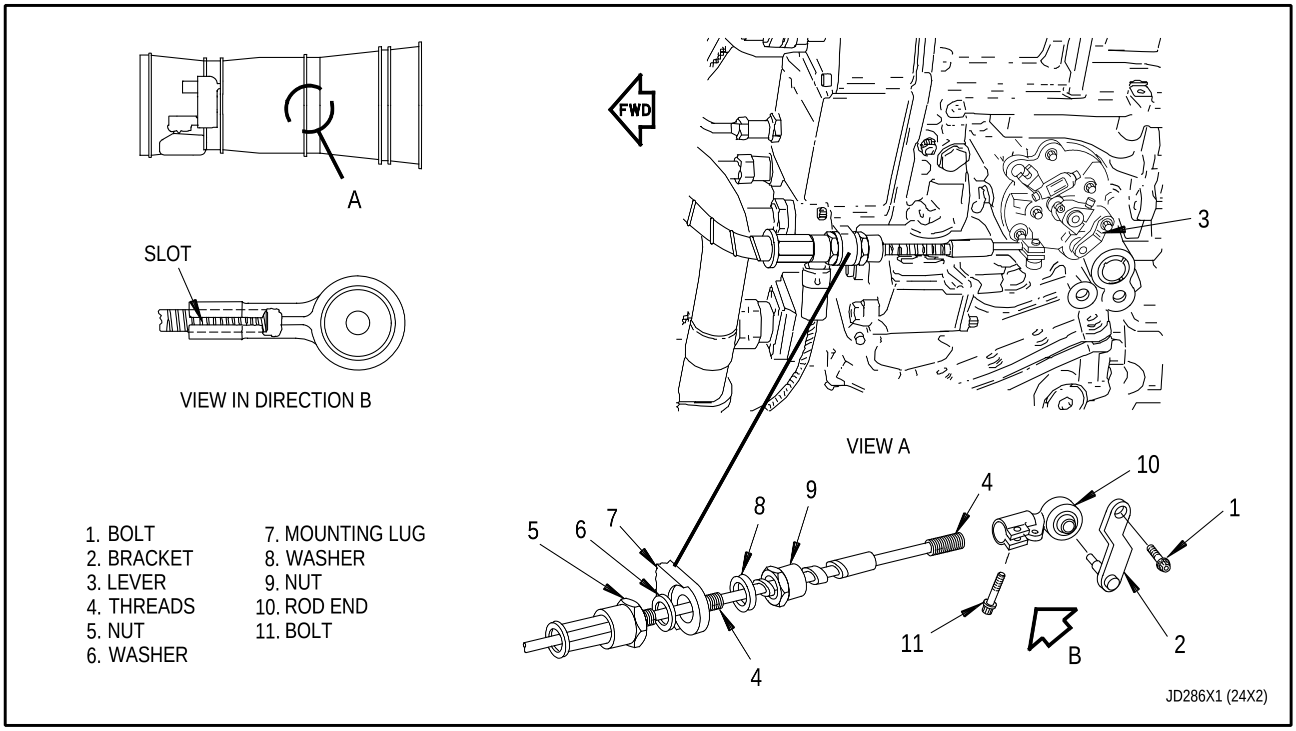


Figure 13. Main Fuel Control - Installation of Rear Compressor Variable Vane Feedback Push-pull Control

9. MODE SOLENOID HARNESS AND SCREEN ASSEMBLY - REPLACEMENT.

(See Figure 14.)

CAUTION

Contamination of MFC will make it unserviceable.

a. Place MFC on a clean work bench. Position control so mode solenoid and screen assembly can be easily removed.

NOTE

Do not disturb RCVV feedback push-pull cable rigging when disconnecting cable from control.

(1) If control is mounted on engine, disconnect electrical connector(9). Disconnect RCVV feedback cable. Refer to paragraph 8 step q.

b. Clean area around switch cover(7, figure 14) using a clean cloth moistened with P-D-680, Type II petroleum solvent. Blow area dry with clean compressed air.

c. Remove nut(5) and washer(4) from electrical connector(9).

CAUTION

Use caution when removing cover(7) and electrical connector(9), damage to internal wiring harness can result.

d. Remove screws(2, 3, and 6) and washers(1). Carefully remove cover(7) while separating electrical connector(9).

e. Remove and discard packing(8).

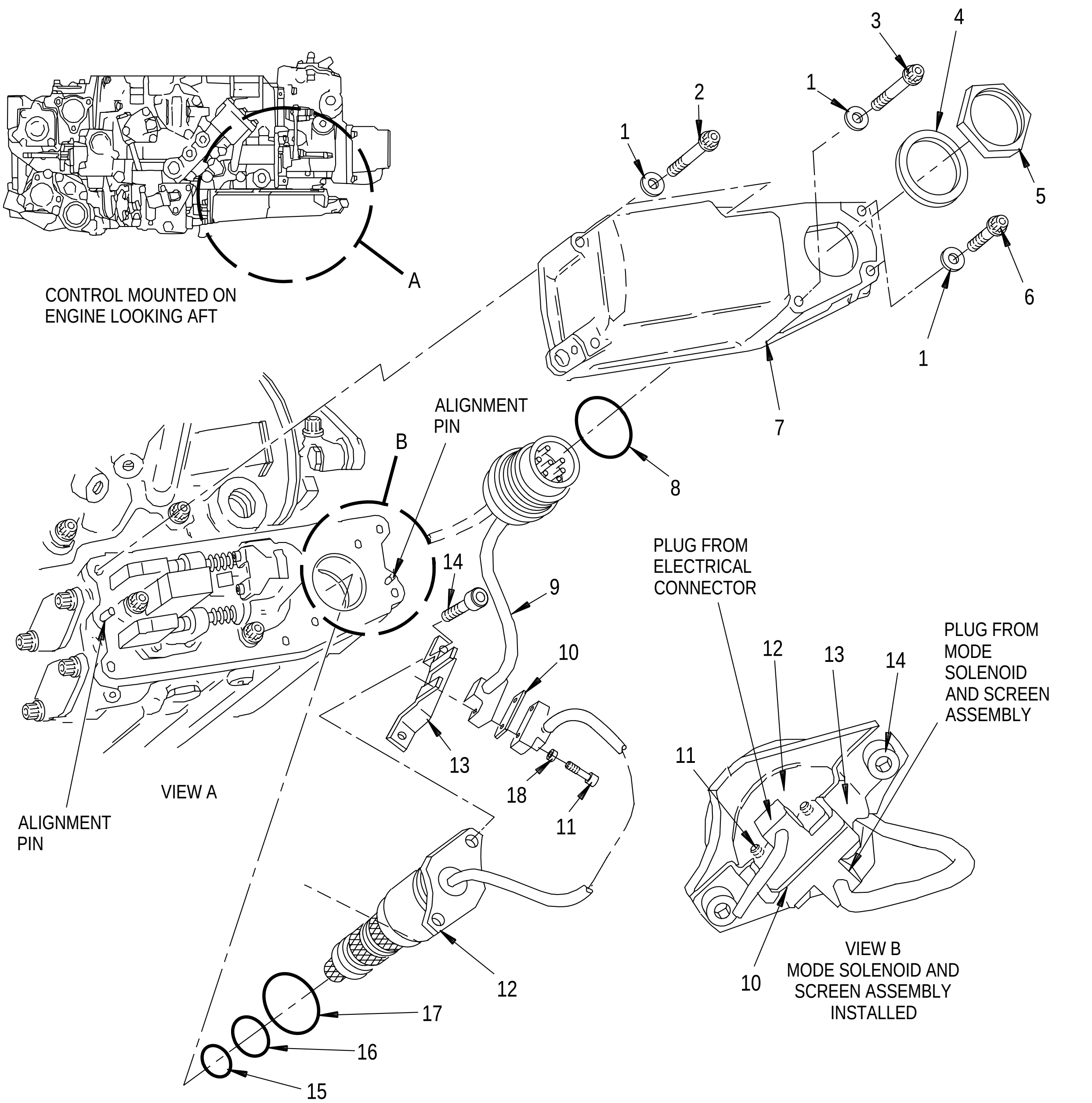
f. Remove screws(11) and washers(18). Disconnect electrical plug. Remove and discard connector seal(10).

CAUTION

Do not pull on wiring harness to remove mode solenoid and screen assembly.

g. Remove screws(14) and retainer(13). Remove mode solenoid and screen assembly(12). Remove and discard packings(15, 16, and 17).

h. If it is difficult to remove mode solenoid and screen assembly, thread 1/4-28 screws, 2 inches long into cover flange screw holes to make removal easier.



1. WASHER
2. SCREW
3. SCREW
4. WASHER
5. NUT
6. SCREW
7. PROTECTIVE MODE SOLENOID COVER
8. PACKING (PN 2666850-27)
9. ELECTRICAL CONNECTOR J112
10. CONNECTOR SEAL (PN 2667808)
11. SCREW
12. HARNESS AND SCREEN ASSEMBLY (PN 2667765E)
13. ELECTRICAL RETAINER
14. SCREW (PN 953536-154)
15. PACKING (PN 2667998-15)
16. PACKING (PN 2667998-17)
17. PACKING (PN 2667998-26)
18. WASHER

Figure 14. Mode Solenoid Harness And Screen Assembly - Replacement

i. Ensure no chips or slivers from packings are left in control.

j. Remove replacement mode solenoid and screen assembly from Bendix PN 351002A parts kit. Remove all protective closures from assembly. Hold closures for later use on mode solenoid and screen assembly removed from engine.

k. Lubricate packings (15, 16, and 17) with a light coat of VV-P-236 petrolatum. Install on mode solenoid and screen assembly (12).

CAUTION

- Using screws (14) to pull mode solenoid and screen assembly (12) into control may damage equipment.
- Cutting or nicking packings (15, 16, and 17) will cause packing chips which may cause damage to control.

NOTE

The following procedures are required to ensure that solenoid packings are not damaged.

k1. While guarding against cutting or nicking packings (15,16,17), install mode solenoid and screen assembly (12) on control. Ensure it is installed properly in relation to connector plug on wiring harness. Ensure flange is flush against mating face of control.

k2. Remove the solenoid from the bore, and inspect packings for damage. If packings are damaged, replace and go to step k1. If packings are not damaged, go to step l.

l. Install mode solenoid and screen assembly (12) on control. Ensure it is installed properly in relation to connector plug on wiring harness. Ensure flange is flush against mating face of control. Install retainer (13) and screws (14). Tighten screws (14) fingertight.

m. Torque screws 20 to 25 pound-inches. Lockwire screws (14) together using PN MS9226-01 wire.

n. If control is mounted on engine, perform leak check of MFC. Refer to T.O. 2J-F100-11-2, WP 302 00.

o. Place connector seal (10) on pins of electrical connector (9). Mate with electrical connector of mode solenoid and screen assembly (12).

p. Attach electrical connectors to retainer (13) with washers (18) and screws (11). Torque screws (11) 20 to 24 ounce-inches.

q. Lockwire screws (11) together using PN MS9226-01 wire.

r. Coat packing(8) with VV-P-236 petrolatum.

NOTE

Ensure connector flat on connector(9) is aligned with hole flat in cover(7).

s. Install packing(8) on connector(9). Install connector(9) in cover(7). Install washer(4) and nut(5). Tighten nut(5) fingertight.

t. Install cover(7) on control. Place wires under cover so they are not chafed and do not interfere with other parts. Install washers(1) and screws (2, 3, and 6) fingertight.

u. Torque screws(2, 3, and 6) 10 to 15 pound-inches. Tighten screws alternately in 5 pound-inch increments until full torque is applied.

v. Torque nut(5) 55 to 60 pound-inches.

w. Lockwire cover screws using PN MS9226-03 wire as follows:

(1) Lockwire screws(6) to each other.

(2) Lockwire nut(5) to closest screw(3).

(3) Lockwire three screws(2) to each other.

x. If control is mounted on engine, connect RCVV feedback cable to control. Refer to paragraph 8 step v.

y. If control is mounted on engine, connect electrical cable connector(9) to mating receptacle on mode solenoid and screen assembly as follows:

(1) Align keyways and handtighten connector.

(2) Ensure red line on receptacle is not visible when viewed at right angles.

(3) Tighten connector firmly with soft-jawed pliers.

z. Preserve unserviceable mode solenoid and screen assembly by dipping in MIL-L-6081, Grade 1005 or 1010 oil. Do not immerse wiring harness. Remove excess oil.

aa. Install closure parts from replacement kit on unserviceable mode solenoid and screen assembly, and pack in shipping container.

10. IGNITION SWITCH WIRING HARNESS ASSEMBLY - REPLACEMENT.
(See Figure 15.)

CAUTION

Contamination of MFC will make it unserviceable.

a. Place MFC on a clean work bench. Position control so ignition switch wiring harness can be easily reached. If control is mounted on engine, disconnect electrical connector P113.

b. Place PLA shaft in cutoff position.

c. Clean area around sensor thoroughly using a clean cloth moistened with P-D-680, Type II petroleum solvent. Blow area dry with clean compressed air at less than 30 psig.

d. Remove screws(2, figure 15) and washers(3). Carefully remove harness(1) from control body.

e. Remove new ignition switch wiring harness assembly from Bendix PN 351003A parts kit. Remove all protective closures from harness assembly.

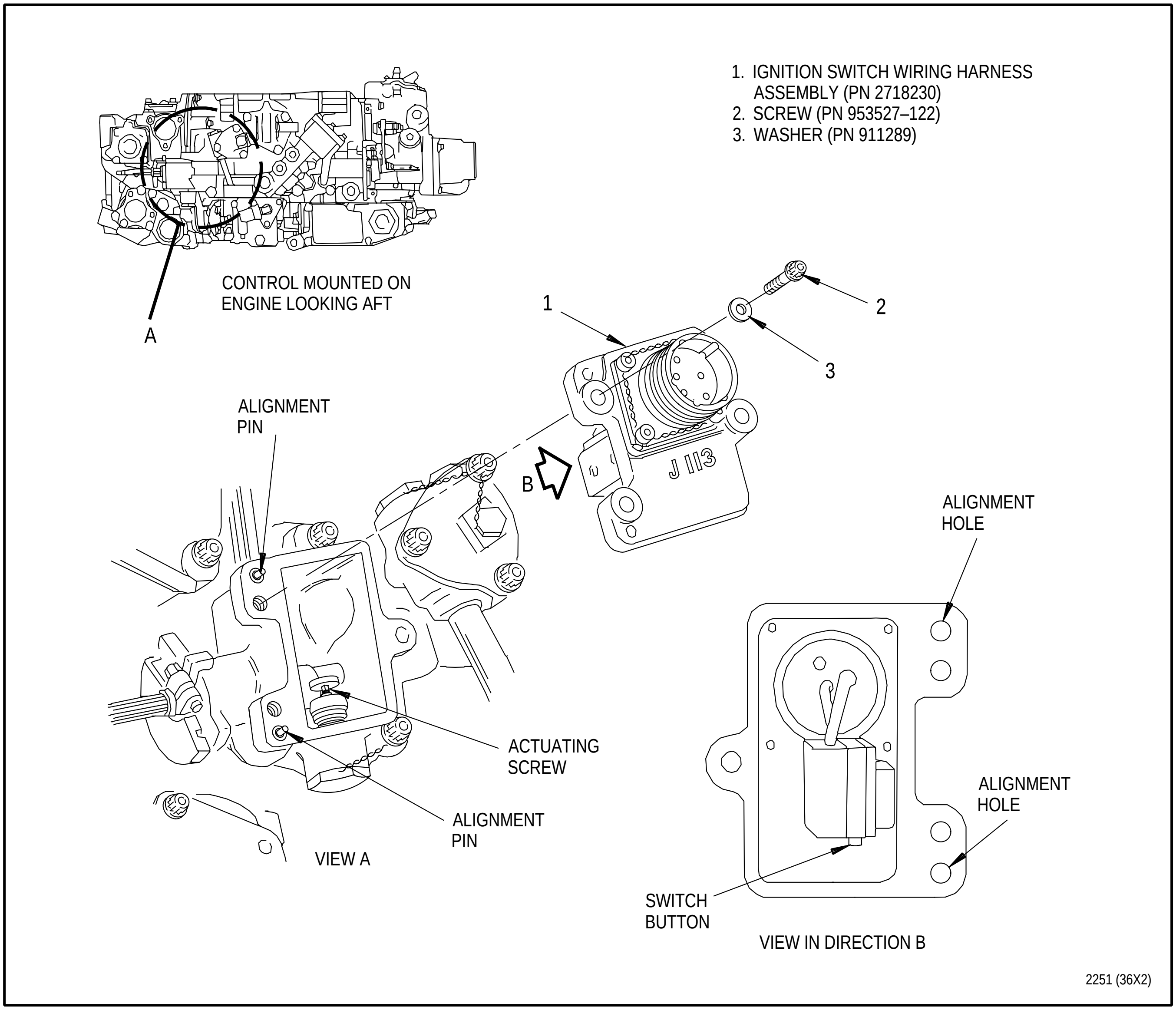


Figure 15. Ignition Switch Wiring Harness Assembly - Replacement

f. Ensure switch button of harness assembly does not hit edge of actuating screw in control body. If switch is damaged, ignition switch wiring harness assembly is unserviceable.

g. Install harness assembly(1) onto control, engaging alignment pins in control face with corresponding holes in wiring harness assembly flange. Switch portion of assembly shall rest on top of actuating screw in control.

h. Install screws(2) and washers(3).

i. Record torque required to thread screw into housing. Torque shall be between 1.5 to 10 pound-inches.

j. If run-in torque is not 1.5 to 10 pound-inches, replace screw and check run-in torque. If it still cannot be met, replace control.

k. Torque screw 10 to 15 pound-inches above torque recorded in step i., alternately, in 5 pound-inch increments until total torque is applied.

l. Using PSM-6 ohmmeter, or equivalent, perform the following electrical check:

(1) Set ohmmeter to R x 1 scale.

(2) Hold ohmmeter leads against Pins A and B of receptacle J113.

(3) Move PLA lever from cutoff to idle, ohmmeter needle should move from approximately zero to scale maximum.

(4) Move PLA lever back to cutoff, needle should return to zero.

(5) Repeat procedure with ohmmeter leads against Pins D and E of receptacle J113.

m. If control is mounted on engine, connect electrical cable connector P113 to mating receptacle on control as follows:

(1) Align keyways and handtighten connector.

(2) Ensure red line on receptacle is not visible when viewed at right angles.

(3) Tighten connector firmly with soft-jawed pliers.

n. Install protective closures from replacement kit on unserviceable ignition switch wiring harness assembly, and pack it in shipping container.

11. METERING VALVE ELECTRO-HYDRAULIC SERVO-VALVE (EHV) - REPLACEMENT.

(See Figure 16.)

CAUTION

Contamination of MFC will make it unserviceable.

a. Place MFC on a clean work bench. Position control so metering valve EHV can be easily removed. If control is mounted on engine, disconnect electrical connector P108.

b. Clean area around EHV using a clean cloth moistened with P-D-680, Type II petroleum solvent. Blow area dry with compressed air.

c. Place a container under control to catch any fuel as EHV is being removed.

d. Remove screws(2, figure 16) and washers(3). Remove EHV(1). Remove and discard packings(4).

e. Remove replacement EHV from Bendix PN 35104A parts kit. Remove all protective closures from EHV.

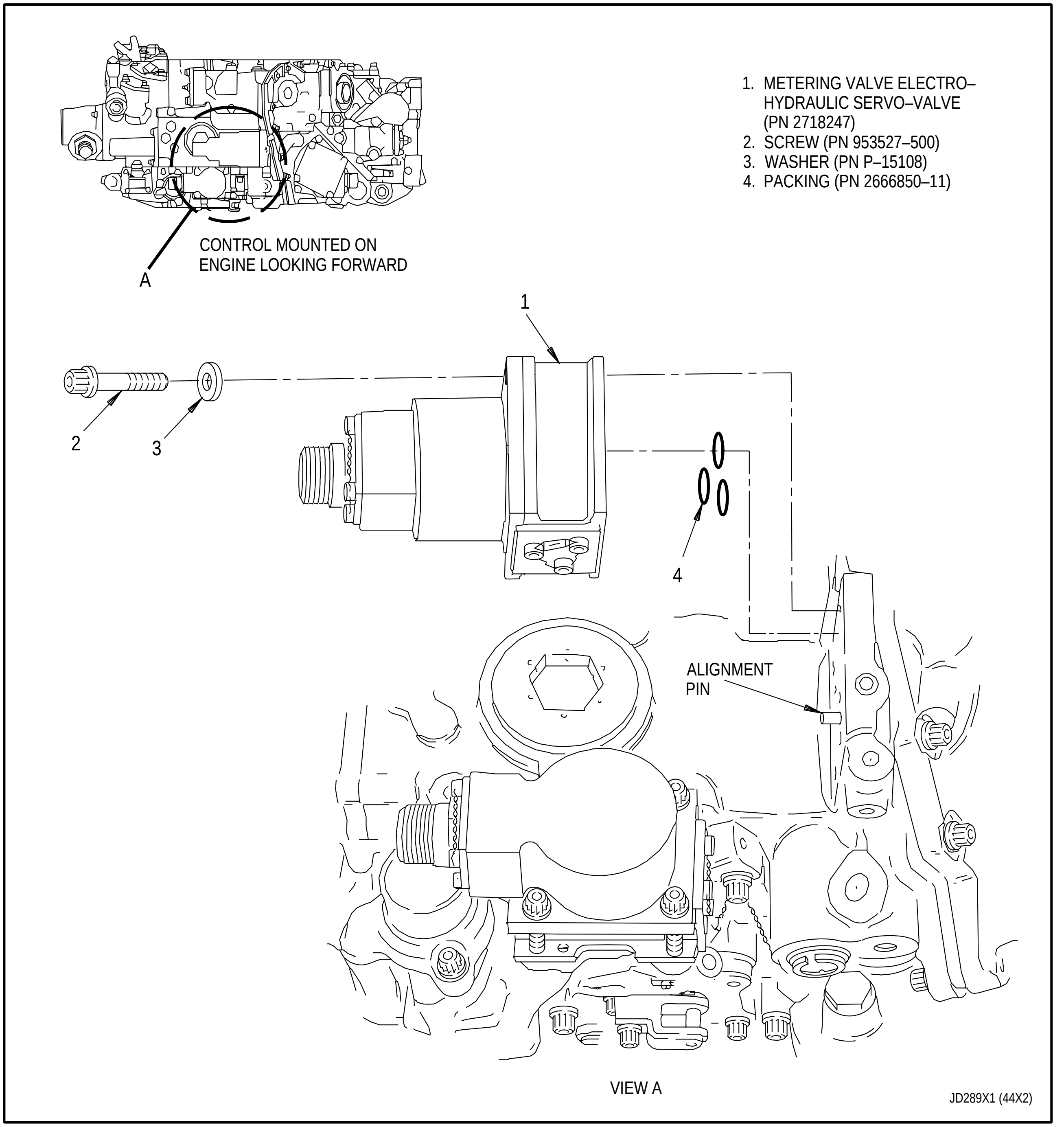


Figure 16. Metering Valve Electro-Hydraulic Servo-Valve - Replacement

f. Lubricate packings(4) with a light coat of VV-P-236 petrolatum. Install on EHV.

g. Install EHV(1) in control. Engage alignment pin in control mating face with hole in EHV flange.

NOTE

Apply light pressure to EHV(1) while installing washers and screws until final torque.

h. Install washers(3) and screws(2) fingertight.

NOTE

If run-in torque cannot be met, replace screw and check run-in torque. If it still cannot be met, replace control.

i. Record run-in torque required to install screw(2) into housing. Torque shall be between 2 to 18 pound-inches.

j. Torque screw(2) 20 to 25 pound-inches above torque recorded in step i, alternately, in 5 pound-inch increments until total torque is applied.

k. If control is mounted on engine, connect electrical cable connector P108 to mating receptacle on EHV as follows:

(1) Align keyways and handtighten connector.

(2) Ensure red line on receptacle is not visible when viewed at right angles.

(3) Tighten connector firmly with soft-jawed pliers.

l. If control is mounted on engine, perform a leak check of the MFC. Refer to T.O. 2J-F100-11-2, WP 302 00.

m. Preserve unserviceable EHV by completely filling it with MIL-L-6081, Grade 1005 or 1010, 10 micron filtered oil. Do not immerse or oil flush electrical connector. Pour out approximately 1 quarter of the oil.

n. Install closure parts from replacement kit on unserviceable EHV and pack in shipping container.

12. REAR COMPRESSOR VARIABLE VANE ELECTRO-HYDRAULIC SERVO-VALVE (EHV) - REPLACEMENT.
(See Figure 17.)

CAUTION

Contamination of MFC will make it unserviceable.

a. Place MFC on a clean work bench. Position control so RCVV EHV can be easily removed. If control is mounted on engine, disconnect electrical connector P111.

b. Clean area around RCVV EHV using a clean cloth moistened with P-D-680, Type II petroleum solvent. Blow area dry with compressed air at less than 30 psig.

c. Place a container under control to catch any fuel as EHV is being removed.

d. Remove screws(2, figure 17) and washers(3). Remove EHV(1) from control. Remove and discard packings(4).

e. Remove RCVV EHV from Bendix PN 351005A parts kit. Remove all protective closures from EHV.

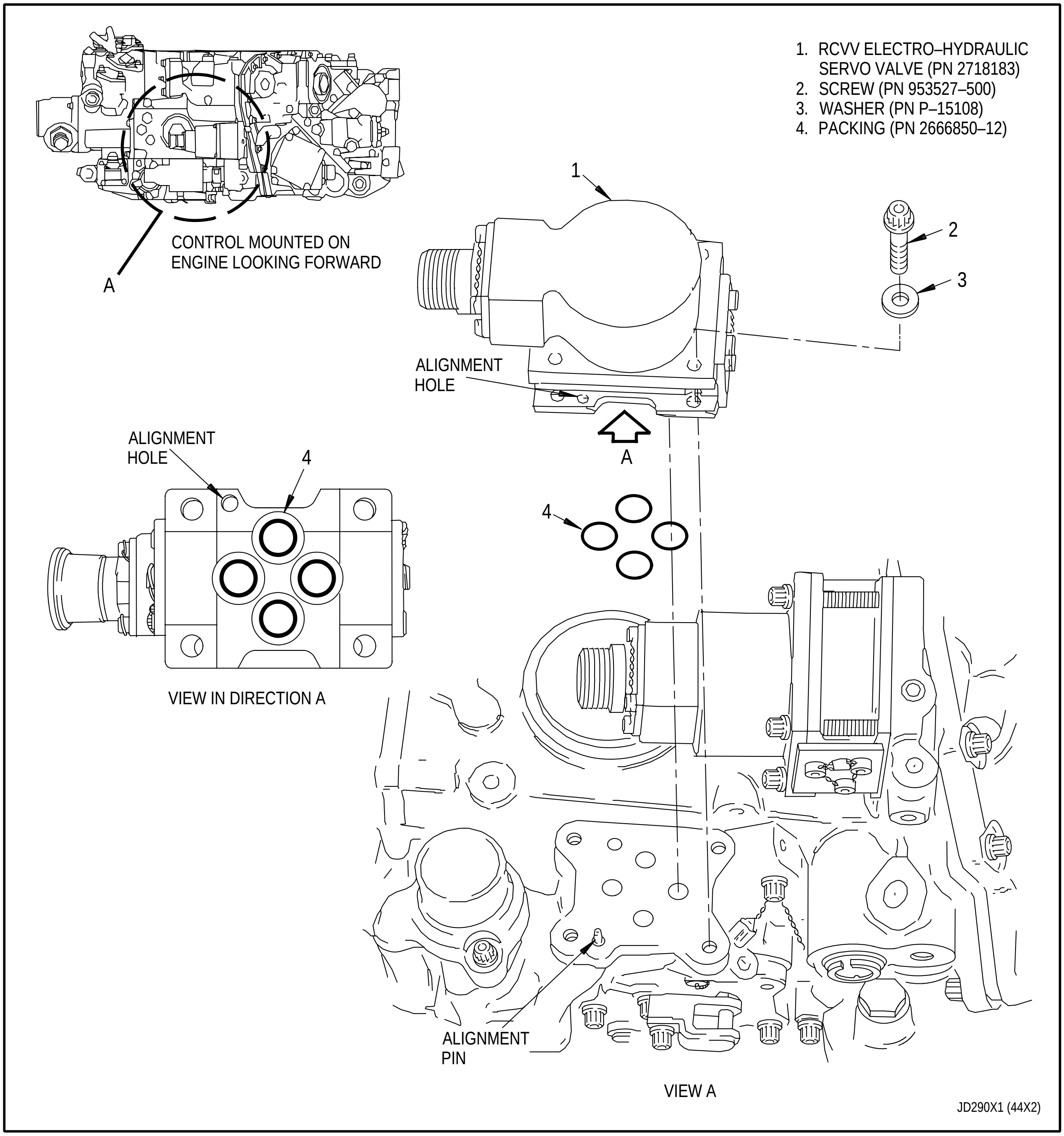


Figure 17. Rear Compressor Variable Vane Electro-Hydraulic Servo-Valve - Replacement

f. Lubricate packings(4) with a light coat of VV-P-236 petrolatum. Install packings on face of EHV.

g. Install EHV(1) in control, engaging alignment pin in control with hole in EHV flange.

NOTE

Apply light pressure to EHV(1) while installing washers and screws until final torque.

h. Install washers(3) and screws(2) fingertight.

NOTE

If run-in torque cannot be met, replace screw and check run-in torque. If it still cannot be met, replace control.

i. Record torque required to install screw(2) into housing. Torque shall be between 2 to 18 pound-inches.

j. Torque screw(2) 20 to 25 pound-inches above torque recorded in step i, alternately, in 5 pound-inch increments until total torque is applied.

k. If control is mounted on engine, connect electrical cable connector P111 to mating receptacle on RCVV EHV as follows:

   (1) Align keyways and handtighten connector.

   (2) Ensure red line on receptacle is not visible when viewed at right angles.

   (3) Tighten connector firmly with soft-jawed pliers.

l. If control is mounted on engine, perform a leak check of the MFC. Refer to T.O. 2J-F100-11-2, WP 302 00.

m. Preserve unserviceable EHV by completely filling it with MIL-L-6081, Grade 1005 or 1010, 10 micron filtered oil. Do not immerse or flush electrical connector. Pour out approximately 1 quarter of the oil.

n. Install protective closures from replacement kit on unserviceable EHV, and pack it in shipping container.

13. START BLEED SOLENOID VALVE AND SCREEN ASSEMBLY - REPLACEMENT.

(See Figure 18.)

CAUTION

Contamination of MFC will make it unserviceable.

a. Place MFC on a clean work bench. Position control so start bleed solenoid valve and screen assembly can be easily removed. If control is mounted on engine, disconnect electrical connector P110 and P108.

b. Clean area around valve and screen assembly with a clean cloth moistened with P-D-680, Type II petroleum solvent. Blow area dry with compressed air.

c. Place a container under control to catch any fuel as valve and screen assembly is being removed.

d. Remove screws(2, figure 18). Pull valve and screen assembly(1) with backup ring(5) from control. Remove and discard packings(3 and 4).

e. Ensure no chips or slivers from packings are left in control.

f. Remove valve and screen assembly, with packings and backup ring, from Bendix PN 351001A parts kit.

g. Remove protective closures from assembly. Hold closures for future use with valve and screen assembly removed from engine.

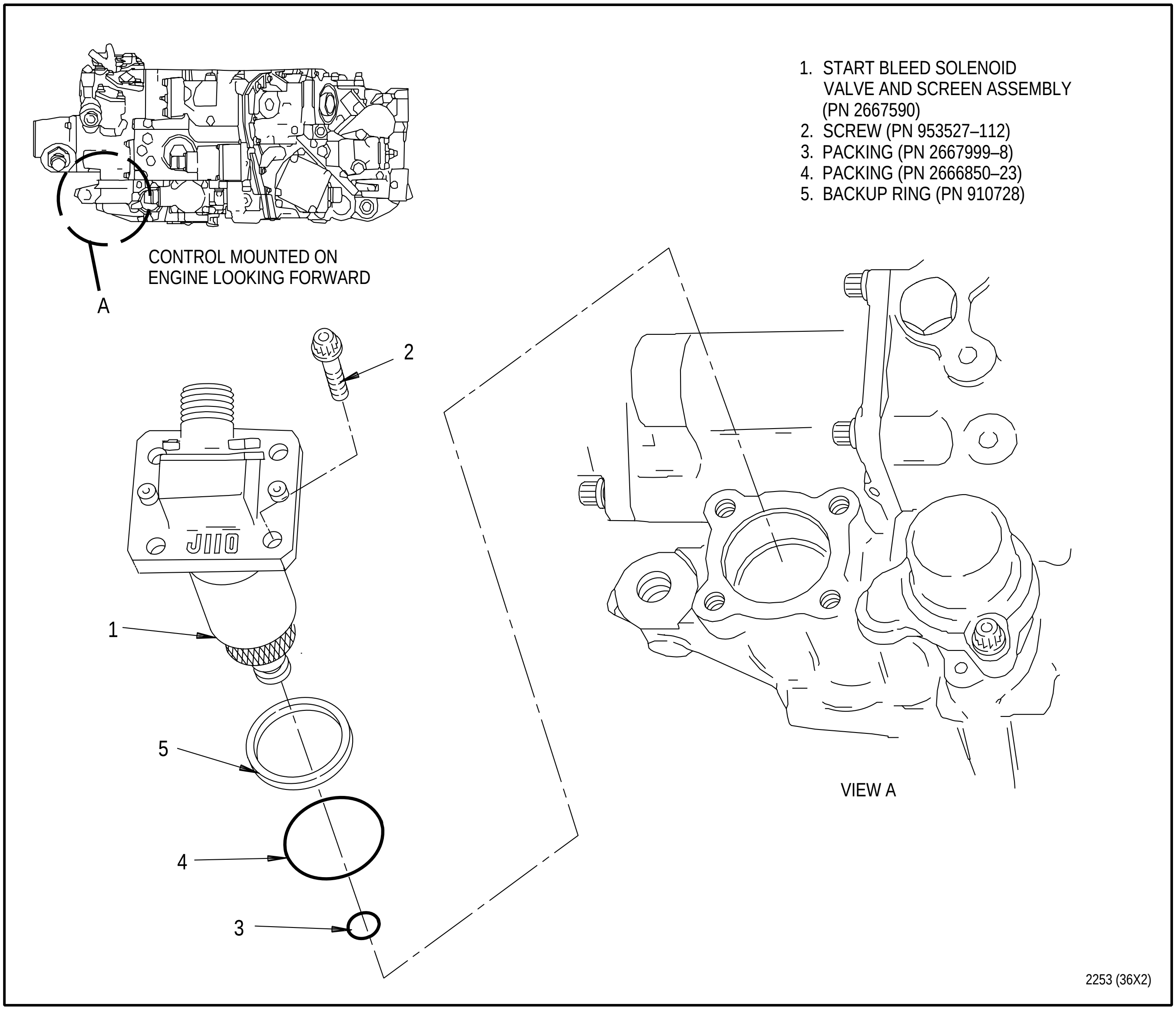


Figure 18. Start Bleed Solenoid Valve and Screen Assembly - Replacement

h. Lubricate packings(3 and 4) and backup ring(5) with VV-P-236 petrolatum.

i. Install backup ring(5) and packing(4) to large diameter groove on solenoid body, with backup ring closer to solenoid cover flange.

j. Install packing(3) to smaller diameter groove on end of solenoid body.

CAUTION

- Do not use screws(2) to pull valve and screen assembly into control body.
- Be careful not to cut or nick packings(3 or 4). Packing chips may contaminate control, making it unserviceable.

k. Insert valve and screen assembly squarely into control body. Ease cover flange flush against mating face of control body.

l. Install screws(2) fingertight.

NOTE

If run-in torque cannot be met, replace screw and check run-in torque. If it still cannot be met, replace control.

m. Record run-in torque required to install screw(2) into housing. Torque shall be between 1.5 to 10 pound-inches.

n. Torque screw 10 to 15 pound-inches above torque recorded in step m, alternately, in 5 pound-inches increments until total torque is applied.

o. If control is mounted on engine, connect electrical connector P110 to mating receptacle on valve and screen assembly as follows:

   (1) Align keyways and handtighten connector.

   (2) Ensure red line on receptacle is not visible when viewed at right angles.

   (3) Tighten connector firmly with soft-jawed pliers.

p. If control is mounted on engine, perform a leak check of the MFC. Refer to T.O. 2J-F100-11-2, WP 302 00.

q. Preserve unserviceable valve and screen assembly by dipping in MIL-L-6081, Grade 1005 or 1010, 10 micron filtered oil. Do not immerse electrical connector. Remove excess oil.

r. Install protective closures from replacement kit on unserviceable valve and screen assembly and pack in shipping container.

14. METERING VALVE RESOLVER AND HOUSING ASSEMBLY - REPLACEMENT.

(See Figure 19.)

CAUTION

Contamination of MFC will make it unserviceable.

NOTE

MFC shall be removed from engine prior to replacement of metering valve resolver and housing assembly.

a. Remove MFC from engine per paragraph 2.

b. Place MFC on a clean work bench. Position control so metering valve resolver and housing assembly can be easily reached.

c. Clean area around resolver thoroughly using a clean cloth moistened with P-D-680, Type II petroleum solvent. Blow area dry with clean compressed air at less than 30 psig.

d. Place a container under control to catch any fuel as plug(7, figure 19, Sheet 1)and resolver are being removed.

e. Note lockwire pattern of plug(7), same pattern shall be used when plug is installed.

f. Remove plug(7) and packing(6) from inspection port, and let fuel drain from control. Discard packing.

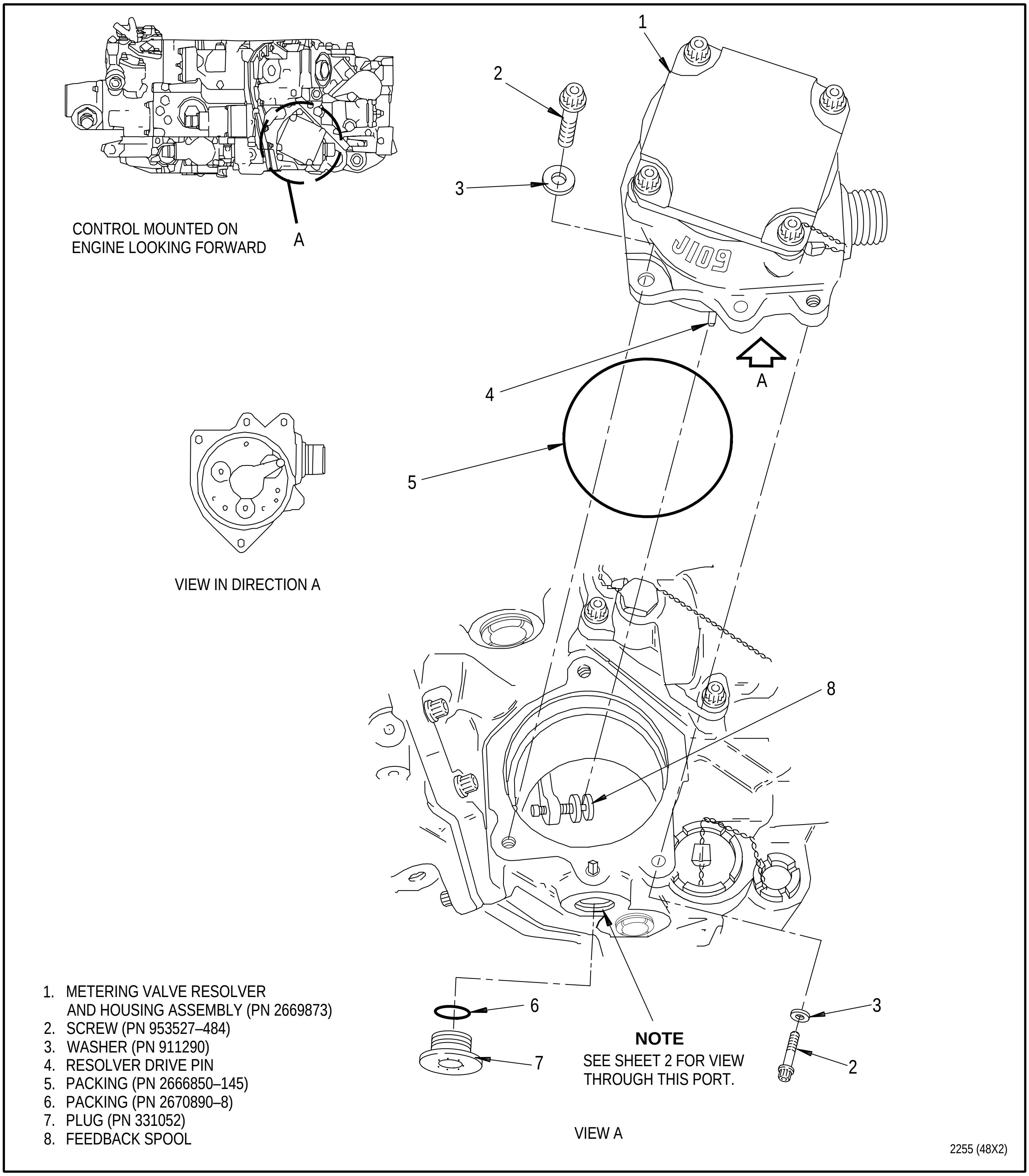


Figure 19. Metering Valve Resolver and Housing Assembly - Replacement (Sheet 1 of 2)

g. Look through inspection port into control body, note engagement of resolver drive pin with feedback spool (figure 19, Sheet 2). This engagement shall be duplicated when replacement resolver is installed.

h. Remove screws(2, figure 19, sheet 1) and washers(3).

i. Carefully remove resolver and housing assembly(1), from control. Discard packing(5).

j. Remove replacement resolver and housing assembly from Bendix PN 351007A metering valve and resolver parts kits. Remove closure parts from assembly and retain them for later use on replaced resolver.

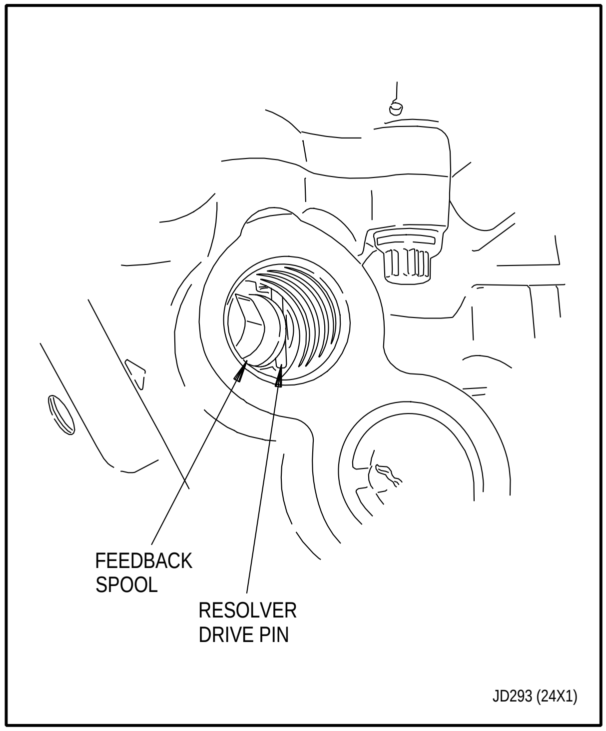


Figure 19. Metering Valve Resolver and Housing Assembly - Replacement (Sheet 2 of 2)

k. Align alignment hole in resolver with alignment pin on control and temporarily install resolver, less packing, on control and check for the following conditions:

(1) Ease of assembly and flush fit of mating surfaces.

(2) Proper engagement of resolver drive pin(4) with feedback spool(8). Drive pin shall engage feedback spool. (See figure 19, sheet 2.)

l. Remove resolver from control.

m. Lubricate packing(5, figure 19, sheet 1) with a light coat of VV-P-236 petrolatum and install on resolver(1).

CAUTION

- Do not use screws(2) to pull resolver into control. Damage to resolver body or drive pin may result.
- Do not cut or nick packing(5) when installing resolver. Packing chips may contaminate control, making it unserviceable.

n. Align alignment hole in resolver with alignment pin on control and install resolver onto control.

o. Look through inspection port in control and verify proper engagement of resolver drive pin with feedback spool. (See figure 19, sheet 2.)

p. Install screws(2, figure 19, sheet 1) and washers(3) fingertight.

q. Torque screws(2) as follows:

(1) Record run-in torque of each screw. Torque shall be 2 to 18 pound-inches.

(2) If run-in torque cannot be met, replace screw. If limit still cannot be met, replace control.

(3) Torque screws 20 to 25 pound-inches above recorded run-in torque, alternately, in 5 pound-inch increments until total torque is applied.

r. Lubricate packing(6) with a light coat of VV-P-236 petrolatum and install on plug(7).

s. Install plug(7) and torque 30 to 35 pound-inches. Lockwire plug to pattern noted in step e., using PN MS9226-04 wire.

t. Preserve unserviceable resolver by completely filling it with MIL-L-6081, Grade 1005 or 1010, 10 micron filtered oil. Do not immerse or oil flush electrical connector. Pour out oil after all mechanical parts have been coated.

u. Install protective closures from replacement kit on unserviceable resolver and pack in shipping container.

v. Install MFC. Refer to paragraph 2.

w. Perform a leak check of the MFC. Refer to T.O. 2J-F100-11-2, WP 302 00.

15. PLA RESOLVER AND COVER ASSEMBLY - REPLACEMENT.

(See Figures 20 and 21.)

CAUTION

Contamination of MFC will make it unserviceable.

NOTE

PLA resolver and cover assembly replacement can be performed with MFC mounted on or removed from engine.

a. Place MFC on a clean work bench if removed from engine. Position control so PLA resolver and cover assembly can be easily reached. If control is mounted on engine proceed to step b.

b. If control is mounted on engine, disconnect electrical connector P107 from resolver and electrical connector P83 from DEEC.

c. Clean area around resolver thoroughly using a clean cloth moistened with P-D-680, Type II petroleum solvent. Blow area dry with clean compressed air at less than 30 psig.

d. Note lockwire pattern used to secure plugs(1 and 10, figure 20, Sheet 1). The same pattern shall be used when plugs are installed.

e. Place a container under control to catch fuel from control.

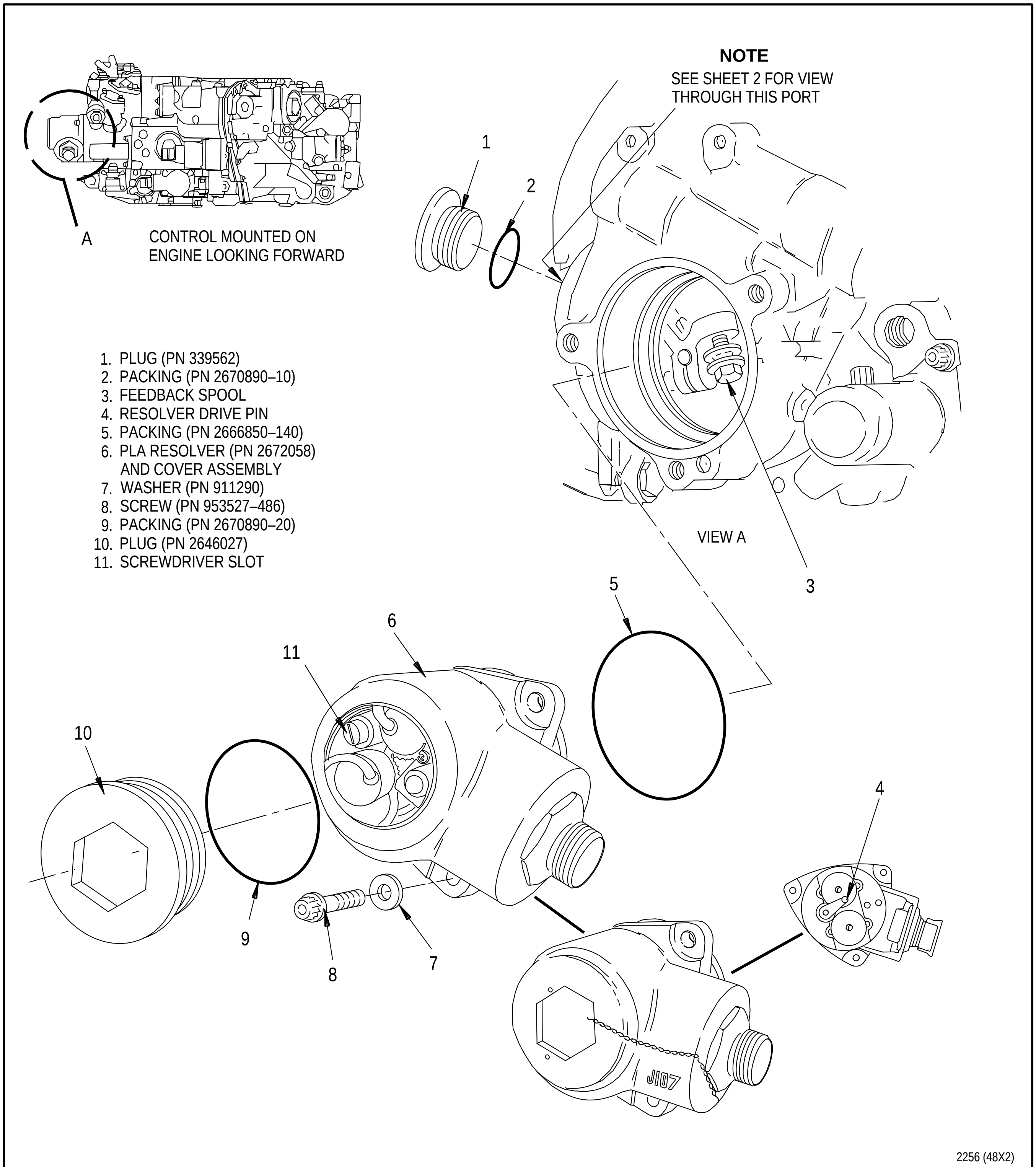


Figure 20. PLA Resolver and Cover Assembly - Replacement (Sheet 1 of 2)

f. Remove plug(1) and packing(2) and drain fuel from control. Discard packing(2).

g. Look through inspection port into control body; note engagement of resolver drive pin with feedback spool (figure 20, Sheet 2.) This engagement shall be duplicated when replacement resolver is installed.

h. Using Bendix hex wrench adapter PN 2552146 or equivalent, remove access plug(10, figure 20, sheet 1) and packing(9). Discard packing(9).

i. Place a common screwdriver in screwdriver slot(11) and gently rotate screwdriver 1/16 of a turn in both directions. Take note of resistance encountered while turning screwdriver. This resistance indicates proper engagement of resolver drive pin(4) with feedback spool(3) and shall be duplicated after installation of replacement resolver.

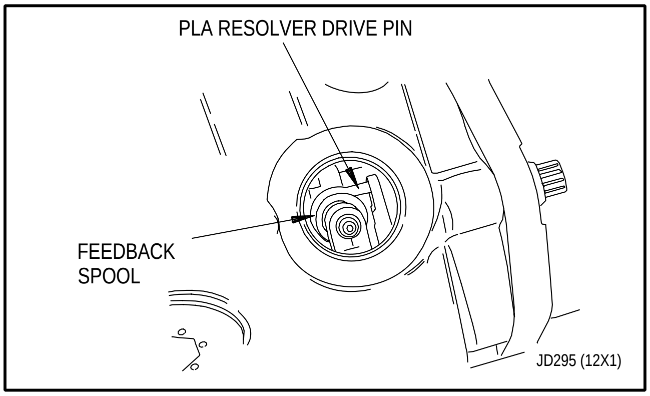


Figure 20. PLA Resolver and Cover Assembly - Replacement (Sheet 2 of 2)

NOTE

A slight gap exists between resolver flange and control body. This gap is normal.

j. Place power lever near max position to reduce snap back of spring loaded resolver drive pin when it disengages from feedback spool drive.

k. Remove screws(8) and washers(7), and carefully pull PLA resolver(6) and packing(5) straight out of control body. Discard packing(5).

l. Remove replacement resolver and cover assembly from Bendix PN 351006A parts kit. Remove protective closures from assembly and retain for later use on replaced resolver.

CAUTION

Bent drive pin will render resolver unserviceable.

m. Perform practice engagement of replacement resolver with MFC as follows:

(1) Do not install packing(5) at this time in order to ease practice engagement.

(2) Place power lever in MAX position.

(3) Make minor PLA adjustments to position feedback spool near center of opening where resolver assembly is installed.

(4) Remove access plug(10) using Bendix hex wrench adapter PN 2552146 or equivalent. Remove and discard packing(9).

(5) When installing PLA resolver and cover assembly, exercise extreme care to avoid bending drive pin when engaging with feedback spool.

(6) Position bottom edge of resolver on bottom edge of control body cavity, while holding resolver at a 20 degree angle to control mating surface. (See figure 21.)

(7) Place a common screwdriver in screwdriver slot and position resolver drive pin in front of feedback spool.

(8) Align screw holes in resolver with screw holes in control body and engage drive pin with feedback spool while installing resolver into control cavity.

NOTE

A slight gap exists between resolver flange and control body. This gap is normal.

(9) Ensure proper seating of resolver on control body.

(10) Look through inspection port into control body to confirm proper drive pin engagement with feedback spool as noted in step g.

(11) Remove resolver from control body.

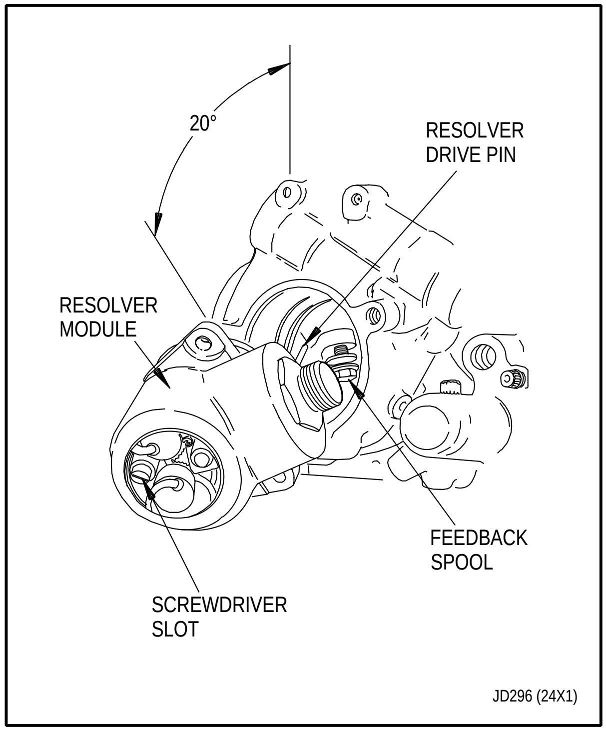


Figure 21. PLA Resolver and Cover Assembly - Installation

n. Lubricate packing(5, figure 20, sheet 1) with VV-P-236 petrolatum and install on PLA resolver and cover assembly(6).

WARNING

Incorrect installation of PLA resolver module can cause auto acceleration to intermediate power or a hung start. Failure to observe this warning can cause death or injury to personnel or damage to equipment.

CAUTION

- Do not use screws(8) to pull resolver and cover assembly into control body. Damage to resolver drive pin may result.
- Do not cut or nick packing(5) when installing resolver and cover assembly. Contamination from packing chips may render control unserviceable.

NOTE

Installation of PLA resolver and cover assembly is same as practice instruction contained in step m.

o. Install PLA resolver and cover assembly(6) per step m. and as follows:

(1) Look through inspection port to ensure proper engagement of drive pin with feedback spool as noted in step g.

(2) With power lever in several positions, place a common screwdriver in screwdriver slot and gently rotate screwdriver less than 1/16 of a turn in both directions. Resistance shall be same as that noted in step i. If no resistance is encountered, remove resolver and install until properly seated.

(3) Install screws(8) and washers(7) fingertight. Resolver will not be completely flush with control face. A small gap is normal.

(4) Torque screws(8) as follows:

(a) Record run-in torque of each screw. Torque shall be 2 to 18 pound-inches.

(b) If run-in torque cannot be met, replace screw. If limits still cannot be met, replace MFC.

(c) Torque screws 20 to 25 pound-inches above recorded run-in torque, alternately, in 5 pound-inch increments until total torque is applied.

p. Lubricate packing(2) with a light coat of VV-P-236 petrolatum and install on plug(1).

q. Install plug(1) in port. Using a 3/8 inch drive hex wrench socket, torque 30 to 35 pound-inches. Lockwire plug using PN MS9226-04 wire, to configuration noted in step d.

r. Lubricate packing(9) with a light coat of VV-P-236 petrolatum and install on plug(10).

s. Install plug(10) in PLA resolver and housing assembly. Using Bendix hex wrench adapter PN 2552146 or equivalent, torque plug 190 to 200 pound-inches. Lockwire plug using PN MS9226-04 wire as noted in step d.

t. If control is mounted on engine, connect electrical cable connectors P107 to mating receptacle on resolver and cable connector P83 to mating receptacle on DEEC as follows:

(1) Align keyways and handtighten connector.

(2) Ensure red line on receptacle is not visible when viewed at right angles.

(3) Tighten connector firmly with soft-jawed pliers.

u. If control is mounted on engine, perform a leak check of the MFC. Refer to T.O. 2J-F100-11-2, WP 206 00.

v. Preserve unserviceable resolver by completely filling it with MIL-L-6081, Grade 1005 or 1010, 10 micron filtered oil. Do not immerse or oil flush electrical connector. Pour out oil after all parts are coated.

w. Install protective closures from replacement kit on unserviceable resolver and pack in shipping container.

16. Tt2 SENSOR ASSEMBLY - REPLACEMENT.
(See Figures 22 and 23.)

CAUTION

- Contamination of MFC will make it unserviceable.
- Use care while retrieving capillary tube or damage may occur.
- Do not separate probe and capillary tube from Tt2 sensor assembly or damage may occur.

a. If MFC is installed on engine, remove bolts, nuts, and clamps securing probe capillary tube to engine. Disconnect four bolts securing Tt2 sensing probe to fan inlet case. Remove probe from fan inlet case. Retrieve probe capillary tube. (See figure 22.)

b. Do not make sharp bends of less than 3 inch radius in sensor capillary cable, or remove capillary cable from sensor. Damage to capillary tube may result, which will render sensor assembly unserviceable.

c. If MFC is removed place main fuel control on a clean work bench. Position the control so Tt2 sensor assembly can be easily reached.

d. Clean area around sensor thoroughly using a clean cloth moistened with P-D-680, Type II petroleum solvent. Blow area dry with clean compressed air at less than 30 psig.

e. Place a container under control to catch any spilled fuel as sensor assembly is being removed.

Legend for figure 22

Index No.	Nomenclautre	Lubricant	Torque (lb-in.)
1	Tt2 Sensing Probe	-	-
2	Bolt	PWA 550	27 to 30
3	Cable Tie	-	-
4	Capillary Tube	-	-
5	Bolt	PWA 36545	-
6	Clamp	-	-
7	Clamp	-	-
8	Bracket	-	-
9	Nut	PWA 36545	27 to 30
10	Clamp	-	-
11	Bolt	PWA 36545	27 to 30
12	Clamp	-	-
13	Bracket	-	-
14	Nut	PWA 36545	27 to 30
15	Clamp	-	-
16	Bracket	-	-
17	Bolt	PWA 36545	-
18	Clamp	-	-
19	Bolt	PWA 36545	-
20	Clamp	-	-
21	Nut	PWA 36545	-
22	Clamp	-	-
23	Tt2 Sensor Assembly	-	-

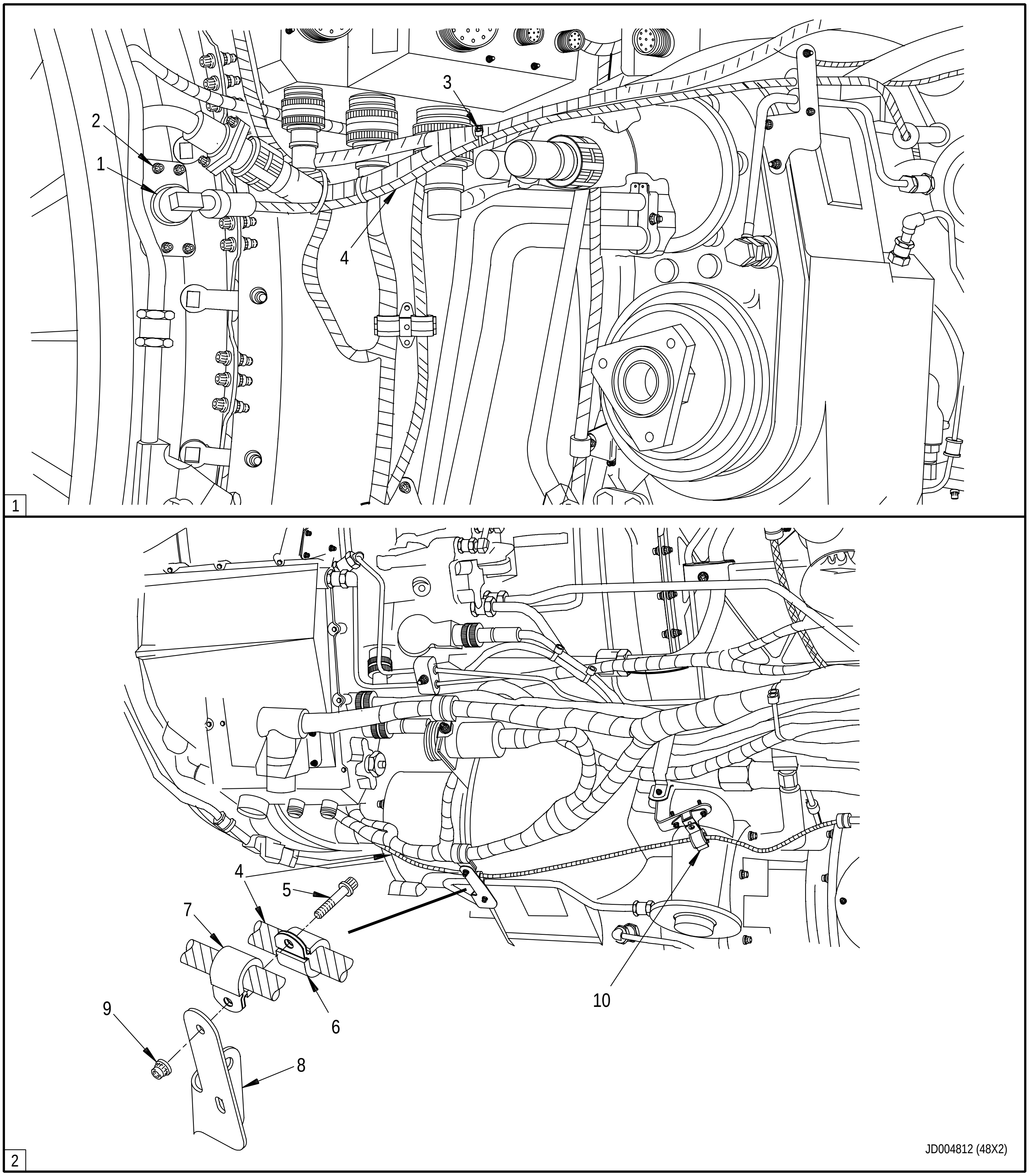


Figure 22. Main Fuel Control Tt2 Sensing Probe and Capillary Tube - Removal and Installation (Sheet 1 of 2)

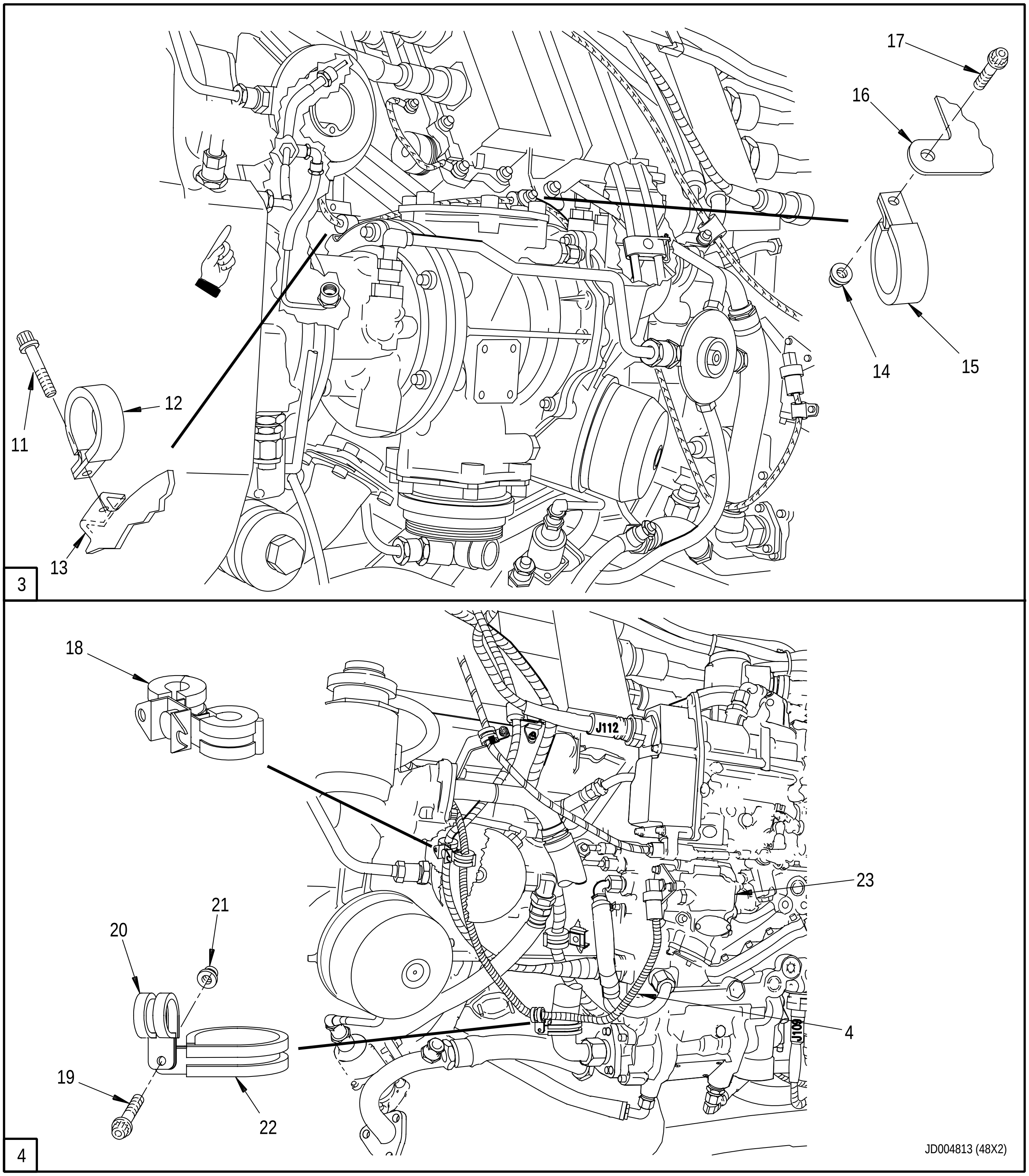
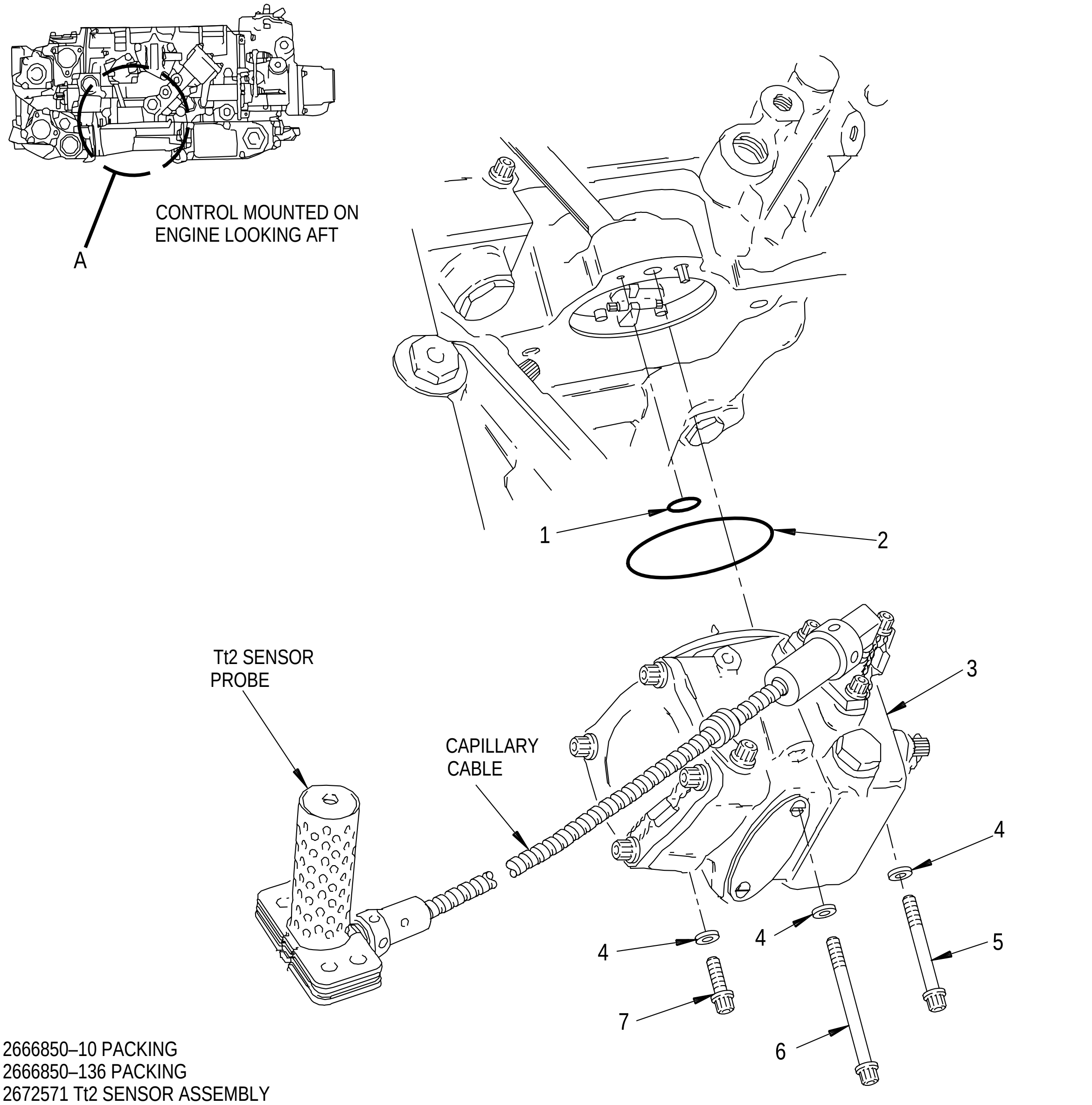


Figure 22. Main Fuel Control Tt2 Sensing Probe and Capillary Tube - Removal and Installation (Sheet 2 of 2)



1. PN 2666850–10 PACKING
2. PN 2666850–136 PACKING
3. PN 2672571 Tt2 SENSOR ASSEMBLY
4. PN 911290 WASHER
5. PN 953527–500 SCREW
6. PN 953527–505 SCREW
7. PN 953527–486 SCREW

Figure 23. Tt2 Sensor Assembly - Replacement

e. Remove screws(5, 6, and 7, figure 23) and washers(4).

f. Carefully remove Tt2 sensor assembly(3) and packings(1 and 2) from control. Discard packings(1 and 2).

g. Remove replacement sensor assembly from PN 351000A parts kit.

h. Ensure new sensor probe has vibration dampers lockwired in place on probe flange. If not, install vibration dampers from removed probe onto replacement probe.

i. Remove protective closures from replacement sensor assembly.

CAUTION

Do not use excessive amounts of VV-P-236 petrolatum to hold packings(1 and 2) in place, as excessive amounts of petrolatum could render MFC unserviceable.

j. Lubricate packings(1 and 2) with a light coat of VV-P-236 petrolatum, and install on mating surface of sensor assembly.

CAUTION

- Do not use screws(5, 6, and 7) to pull sensor into control. Damage to eccentric pin or sensor body may result.
- Do not cut or nick packings when installing sensor. Packing chips may contaminate control making it unserviceable.

k. Align pin in MFC with mating hole in sensor mounting flange. Engage eccentric pin of sensor assembly with slotted lever in MFC.

l. Install screws(5, 6, and 7) and washers(4) fingertight.

m. Torque screws(5, 6, and 7) as follows:

(1) Record run-on torque of each screw. Torque shall be 2 to 18 pound-inches.

(2) If run-on torque cannot be met, replace screw. If limits still cannot be met, replace MFC.

(3) Torque screws 20 to 25 pound-inches above recorded run-on torque, alternately, in 5 pound-inch increments until total torque is applied.

n. Do not twist capillary cable during installation. More than one cable twist is cause for Tt2 sensor assembly rejection.

o. Route capillary cable along bottom of engine, and install Tt2 probe in fan inlet case. (See figure 22.)

(1) Secure probe to fan inlet case with bolts(4). Torque bolts 27 to 30 pound-inches. Lockwire bolts(4) with PN MS9226-04 wire.

(2) Secure capillary cable to engine. (See figure 22.)

p. If control is mounted on engine, a leak check shall be performed. Refer to T.O. 2J-F100-11-2, WP 206 00.

q. Preserve unserviceable Tt2 sensor assembly by completely filling it with MIL-L-6081, Grade 1005 or 1010, 10 micron filtered oil. Pour out oil after completely filling.

r. Coil capillary cable and probe into 6 to 8 inch diameter circle of three to four loops. Do not make sharp bends of less than 6 inch diameter in sensor capillary cable. Damage to capillary tubes may result.

s. Loosely lockwire cable in several places to keep loops together, then loosely lockwire cable and probe to sensor body.

t. Install protective closures from replacement kit on unserviceable Tt2 sensor assembly, and pack in shipping container.

17. MAIN FUEL CONTROL - LEAK CHECK.

(See Figure 24 and Table 1.)

a. Remove PN 4068080 Pf2 tube inlet adapter. (See figure 24.)

b. Place PN 2563702-16 packing on PN 2563752 adapter.

c. Install adapter on Pf2 inlet port and secure with four PN 2563702-15 bolts. Torque bolts 35 to 45 pound-inches.

d. Place PLA lever to 130 degrees maximum stop end of quadrant.

e. Pf4 discharge port acts as a pressure relief valve during leak check. Do not cap this port.

NOTE

Refer to T.O. 3D4-6-617-1 PWA 50096 hydraulic pressure tester for operating instructions.

f. Connect extend hose from PWA 50096 cart containing JP-4 fuel or MIL-C-7024 Type II calibrating fluid to adapter on Pf2 inlet port.

g. Place control in engine mounted position.

h. Apply 10 psig of pressure to control.

i. Cap ports as fluid appears at each port. (See table 1.)

j. Increase pressure 40 to 60 psig, and leak check for 5 minutes.

(1) If fluid leaks from Pf4 port, shut down hydraulic tester. Check pressure level; if less than 30 psig, replace control.

(2) Check for leakage between modules and control mounting surfaces. Repair or replace control, as necessary.

k. Reduce pressure to 0, and remove hose from control.

l. Slowly remove Pf2f port cap, and allow residual pressure to bleed from control.

m. Remove remainder of caps.

n. Position control with Pf1 ports down, and allow fluid to drain from control.

o. Place new PN 2563702-16 packing on Pf2 inlet adapter.

p. Install Pf2 inlet adapter, and torque bolts 35 to 45 pound-inches.

q. Install protective closures to open ports.

Table 1. PN 2563702 Fixture Main Fuel Control - Leakage and Oil Flush Test Adapter

Port	Adapter/Plug Part Number	Washer or Screw Part Number	Packing Part Number
Pf2f	2563702-20	2563702-19	2670890-6
Pfs1	2563702-20	2563702-19	2670890-6
Pfs1m	2563702-20	2563702-19	2670890-6
Pfcbo	2563702-4	2563702-3	2670890-4
Pfcbc	2563702-4	2563702-3	2670890-4
Pfmo	2563702-4	2563702-3	2670890-4
Pfret	2563702-20	2563702-19	2670890-6
Pfext	2563702-20	2563702-19	2670890-6
Pf1 Bypass	2563702-54	2563702-15 screw	2666850-213
Pf1 Return	2563702-55	2563702-9	2670890-8

Table 2. PN 350993B Closure Kit

Port or Conn.	Closure Part Number	Packing/Gasket Part Number	Washer Part Number	Screw Part Number
J107, J109	NAS813-14	-----	-----	-----
J108, J111	175682	-----	-----	-----
J110	NAS813-10	-----	-----	-----
J112	NAS813-16	-----	-----	-----
J113	MS90376-20Y	-----	-----	-----
PS2, PFMO, PFSBC, PFSBO	2663787-004	557-S-4	-----	-----
PF2, PF1 RET	2650791	2659577	901140K1	953527-517
PF4	2630012	2635856	901140K1	953527-517
TT2	2672302	-----	-----	-----
PF RETRACT, PF2F, PFS1, PF EXTEND, PFS1M	2663787-006	557-S-6	-----	-----
PF1	2663787-008	557-S-8	-----	-----

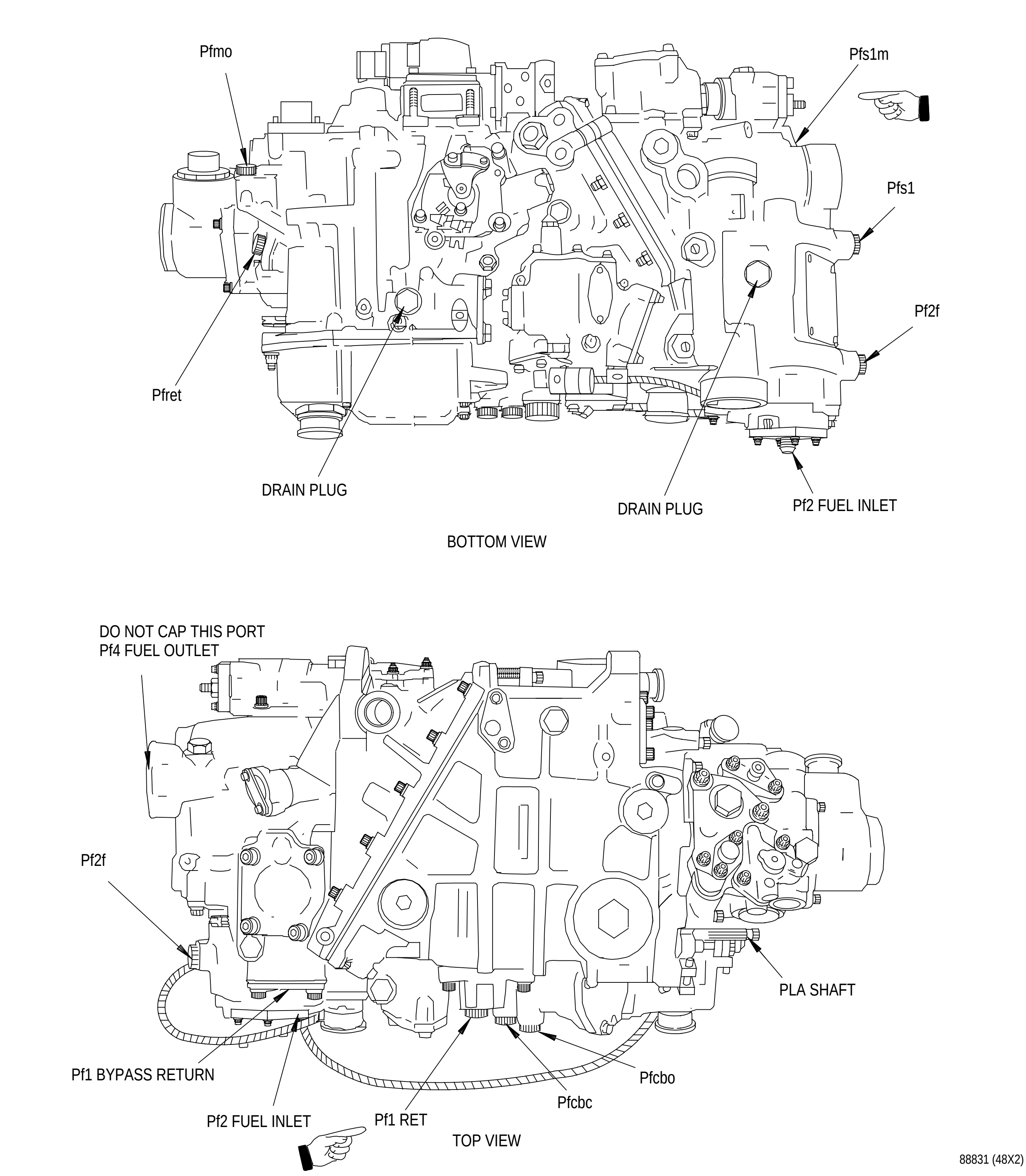


Figure 24. Main Fuel Control - Leak Check (Sheet 1 of 3)

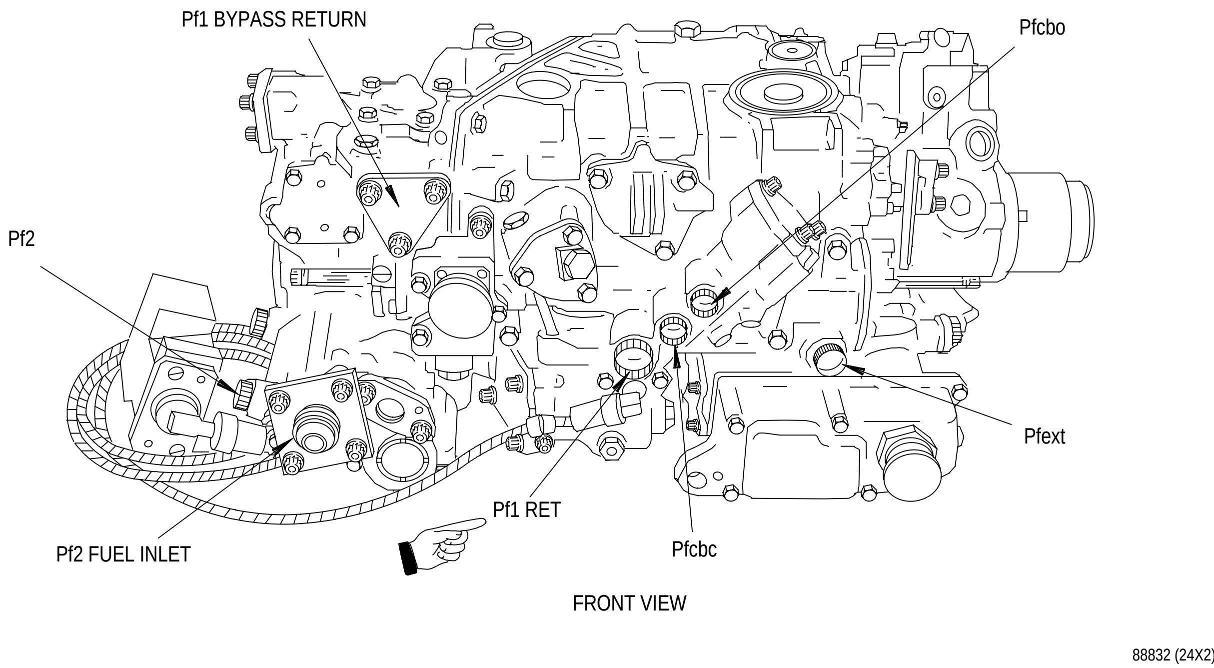


Figure 24. Main Fuel Control - Leak Check (Sheet 2 of 3)

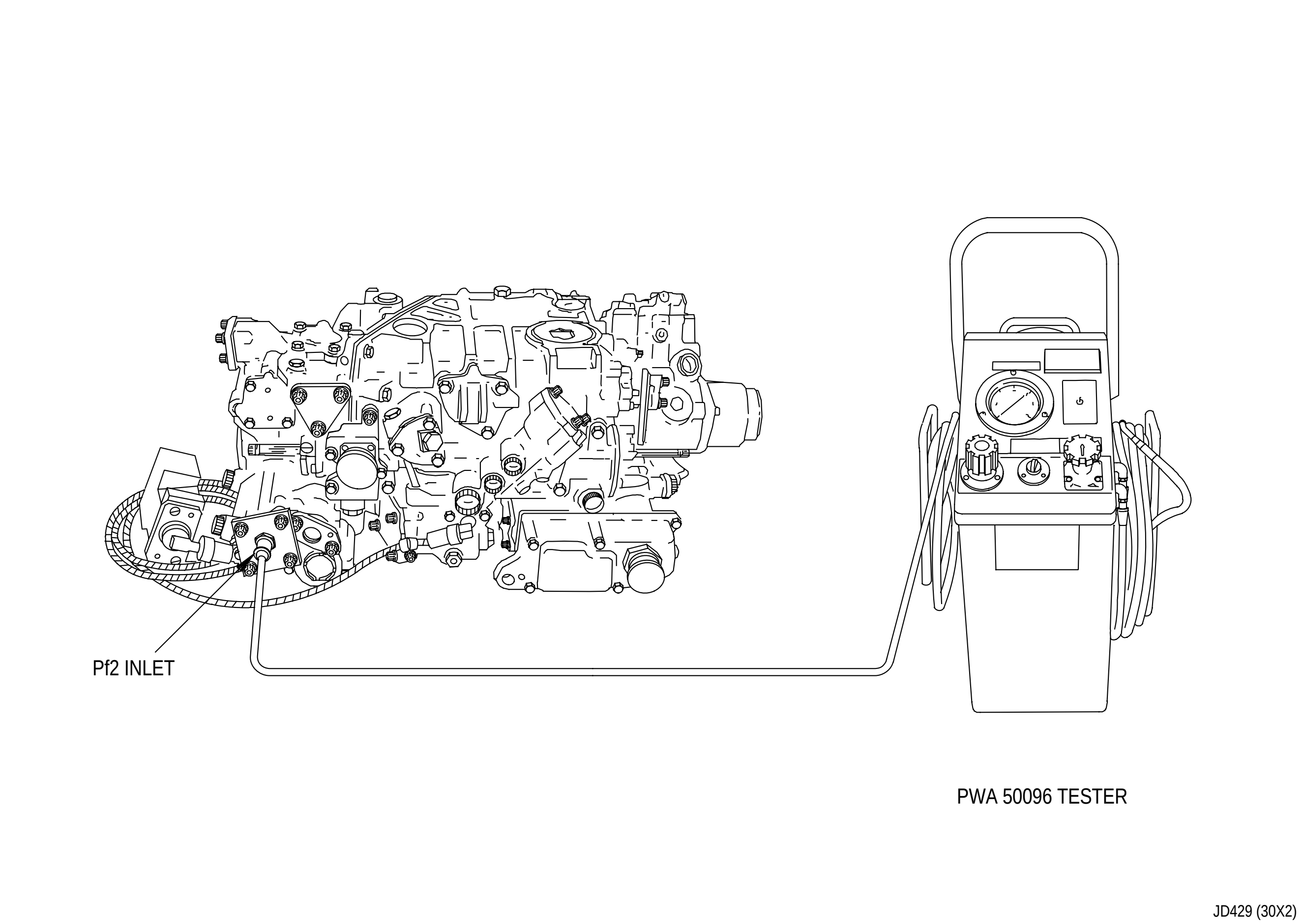


Figure 24. Main Fuel Control - Leak Check (Sheet 3 of 3)

18. MAIN FUEL CONTROL - STORAGE AND SHIPMENT.
(See figure 24 and table 1 and Table 2.)

a. Prepare for storage and shipment as follows:

(1) Install PN 2563752 adapter in Pf2 inlet port. Tighten screws securely.

(2) Install PN 2563702-55 adapter (table 1) in Pf1 return port located on bleed valve body. Tighten screws securely.

(3) Install PN 2563702-54 cover (table 1) on Pf1 bypass port. Tighten screws securely.

CAUTION

Removing closures from electrical connectors or PS2 port at any time during oil flush procedure will allow entry of contaminants which may result in damage to equipment.

b. Install PN 350993B closures (table 2) on J107, J108, J109, J110, J111, J112, and J113 electrical connectors.

c. Cap PS2 port with PN 2663878-004 closure.

d. Cap remaining open ports with PN 2563702 plugs.

e. Place PLA at MAX position.

NOTE

Ensure PWA 50096 hydraulic cart is serviced with MIL-L-6081 grade 10-10 oil and filter element is not contaminated or bypassing.

f. Connect PfExt supply line from PWA 50096 hydraulic cart to Pf2 inlet adapter.

g. Connect Pf return line to Pf1 return adapter located on bleed valve body.

h. Set regulator on PWA 50096 hydraulic cart to 0 by turning regulator knob full CCW.

h1. Position cart selector to the EXTEND position and turn cart power on.

i. Apply 30 to 40 psi to control.

NOTE

An elapsed time of 5 minutes is not unusual when waiting for clear oil to flow from the PF2F port.

j. Remove plug from Pf2f port to observe MIL-L-6081 grade 10-10 oil flow. Reinstall plug once clear oil flows freely. Repeat this step for ports Pfs1, Pfs1M, PfMO, PfExt, PfRet, PfcBo, and PfcBC.

k. Set PfExt pressure to 110 to 120 psi.

l. Cycle PLA from MAX to CUT-OFF and back five times.

m. Set pressure to 0. Place selector in neutral position and turn cart power off.

n. Disconnect PfExt and PfRet lines from control, and remove PN 2563752 adapter and PN 2563702 plugs.

o. Pour MIL-L-6081 grade 10-10 oil into Pf4 outlet and Pf1 bypass ports. Drain excess.

p. Install remaining 350993B closures, and return control to supply for disposition.

SUBORDINATE WORK PACKAGE

TECHNICAL PROCEDURES

SEAL - PLA SHAFT, MAIN FUEL CONTROL

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE SWP PAGES

Total Number of Pages in this SWP is 14

REFERENCE MATERIAL REQUIRED

Title	Number
Operation and Service Instructions Depot Engine Test	T.O. 2J-F100-11-2
Engine Test Requirements	WP 206 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Dental pick	None
Petrolatum	VV-P-236
Solvent, Dry-cleaning	P-D-680
Tongue depressor	None

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Cotter pin	MS24665-151	1
Cotter pin	MS24665-153	1
Packing	Bendix 2670890-5	1
Lockwire	MS9226-03	1
Self-locking nut	Bendix 2628856	1
Shaft seal	Bendix 2638219	1
Shaft seal support	Bendix 2638218	1

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function -Tool Nomenclature	Tool Number
3	Removal of Shaft Seal Rig Pin	PWA 52419

ILLUSTRATED SUPPORT EQUIPMENT

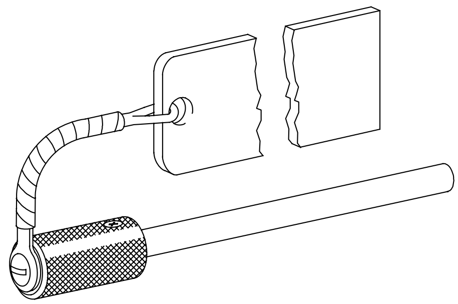


Figure T1. PWA 52419 Rig Pin

1. INTRODUCTION.

a. This subordinate work package contains instructions for replacement of PLA shaft seal in CJBA1 turbine engine main fuel control.

2. SHAFT SEAL - REMOVAL.

(See Figures 1, 2 and 3)

a. Cut and remove lockwire or cotter pins from following control locations:

(1) Purge-and-drain plug (1, figure 1)

(2) PLA rigging lever retaining screw (2), castellated hex nut (3), and hex nut (4).

WARNING

Jet fuel is flammable and irritates skin, eyses, and respiratory system. Jet fuel vapors will accumulate in an area allowing ignition from a distance. Keep ignition sources away. Provide ventilation that exhausts fuel vapors away from distant ignition sources. Wear protective clothing/equipment.

b. Remove purge-and-drain plug(1), and packing from control body. Drain all residual fuel from control. Discard packing.

c. Remove shaft seal.

NOTE

PLA input lever is not splined; coupling adapter has a 24-tooth side and a 25-tooth side.

(1) Make an alignment mark on PLA input lever (1, figure 2), coupling adapter(2) and PLA rigging lever(3). Use a fine tip pen or other indelible marking or scribe.

WARNING

Engine start before installation of rig pin could allow engine to auto-accel to MAX causing injury or death to personnel.

CAUTION

Omitting installation of rig pin may damage internal PLA cam lever assembly.

(2) Using PWA 52419 rig pin, install rig pin to lock PLA rigging lever(3) in PLA housing assembly(4) at 16.5° PLA position.

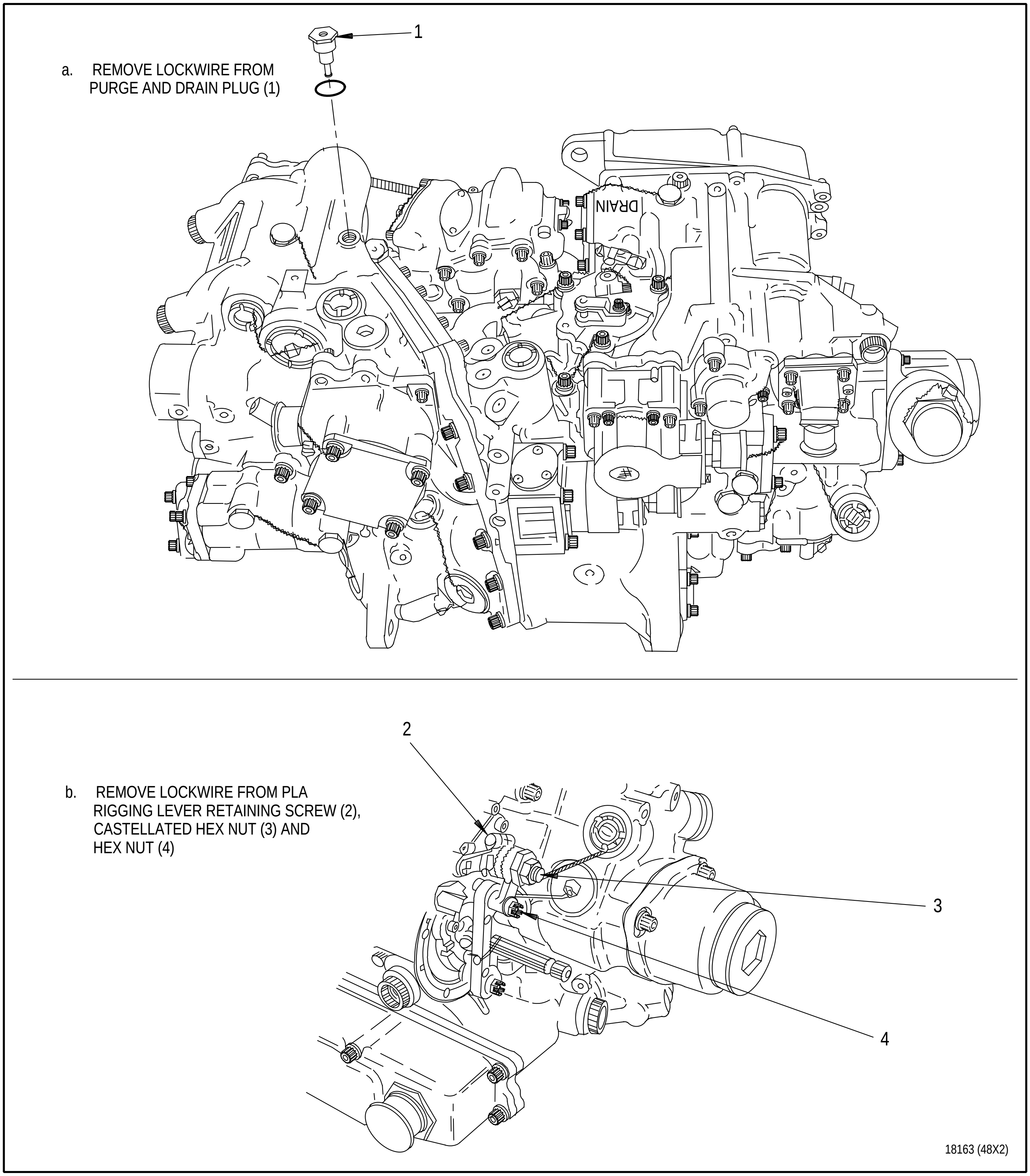
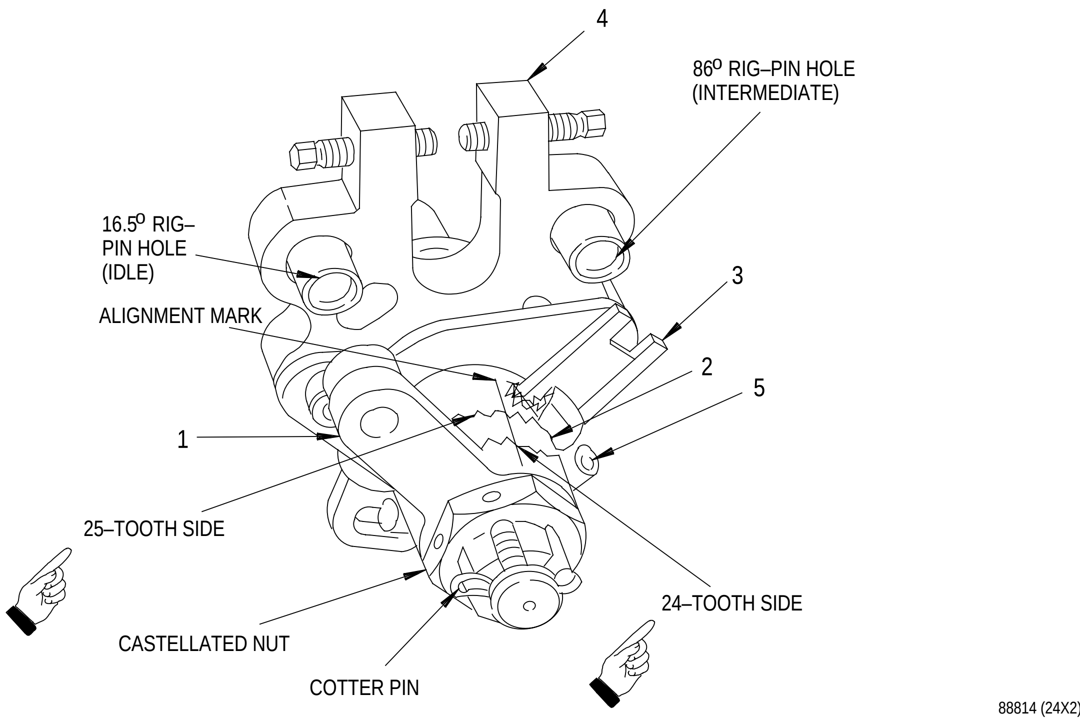


Figure 1. Lockwire Locations



1. PLA input lever
2. Coupling adapter
3. PLA rigging lever
4. PLA housing assembly
5. PLA riging lever retaining screw (12-pt. machine screw)

Figure 2. PLA Input Lever Installed

NOTE

PLA input lever remains attached to throttle link assembly. Do not lose shim.

(3) Remove cotter pin (1, Figure 3) and castellated hex nut (2) retaining PLA input lever(3) and coupling adapter (4). Remove cotter pin(15), hex nut(16), and shim(17), loosening PLA input lever (3) from throttle link assembly(14). Slide PLA input lever and coupling link adapter off PLA shaft(13).

(4) Using standard 3/8-inch deep-well socket, remove self-locking nut(6) retaining PLA rigging lever(7). Discard self-locking nut.

(5) Remove 12-point machine screw(5) retaining PLA rigging lever. Remove rig pin. Remove lever from PLA shaft.

(6) Remove hex socket-head cap screws(8,9) retaining seal cover(10).

(7) Remove seal cover(10).

(8) Using dental pick or equivalent, remove shaft-seal support(11) and shaft seal(12). Discard support and seal.

1. PIN, COTTER
2. NUT, HEX, SPECIAL
3. LEVER, PLA INPUT
4. ADAPTER, COUPLING
5. SCREW, MACHINE, 12–POINT, DRILLED
6. NUT, SELF–LOCKING
7. LEVER, PLA RIGGING
8. SCREW, CAP, HEX SOCKET HEAD
9. SCREW, CAP, HEX SOCKET HEAD
10. COVER, SEAL
11. SUPPORT, SHAFT SEAL, PN 2638218
12. SEAL, SHAFT
13. SHAFT, PLA
14. LINK ASSEMBLY, THROTTLE
15. PIN, COTTER
16. NUT, HEX, SPLINED
17. SHIM

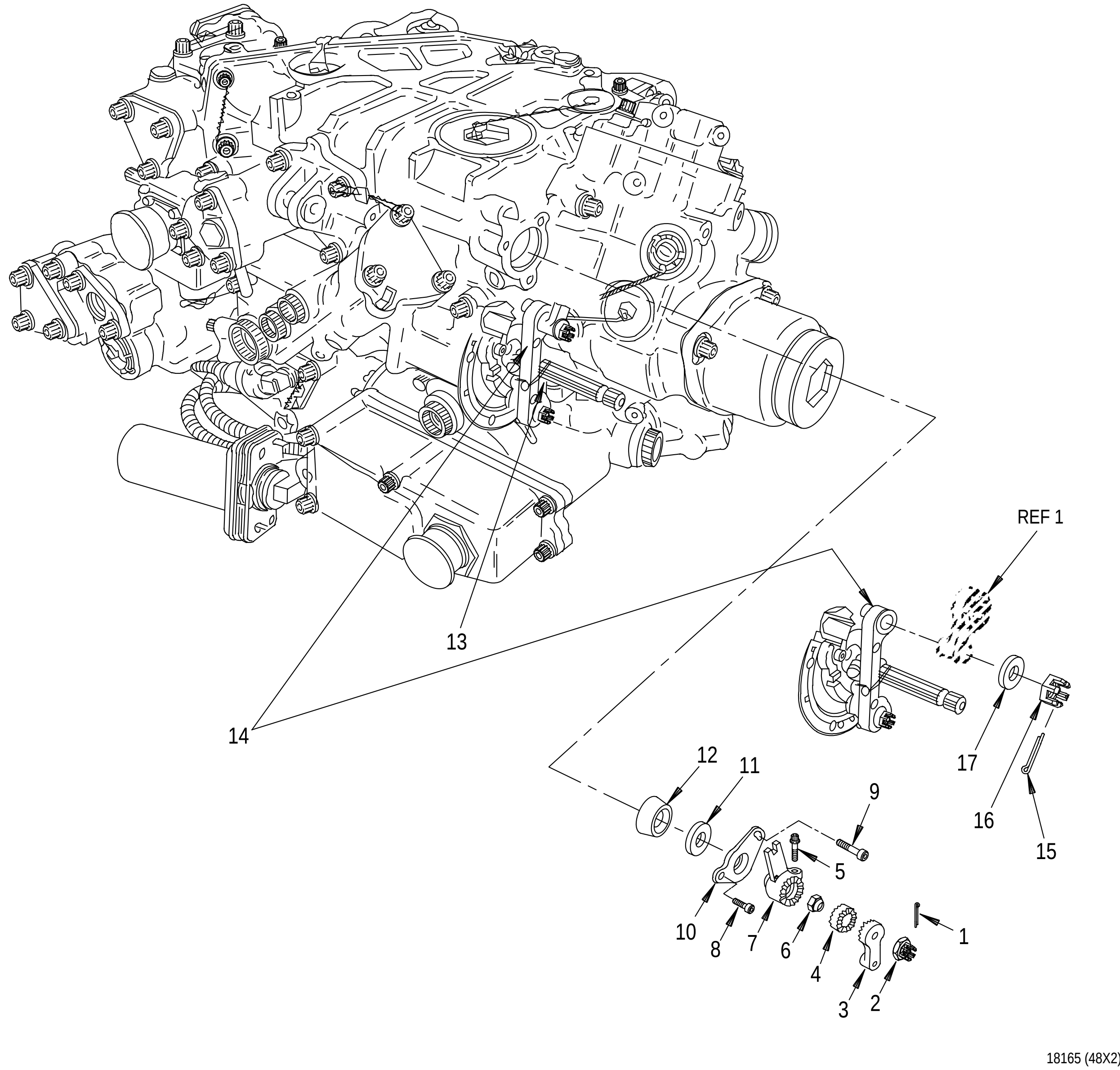


Figure 3. PLA Shaft-Seal - Installation

3. SHAFT SEAL - INSTALLATION.
(See Figures 4 through 6.)

WARNING

Solvent, dry cleaning, P-D-680, Type II or III, is combustible and is an irritant to skin, eyes, and respiratory system. Keep ignition sources away, provide adequate ventilation, and wear protective clothing/ equipment.

a. Remove foreign material deposited on PLA shaft or in shaft seal bushing sleeve area (see figure 4). Use clean lint-free cloth and P-D-680 solvent. Do not allow solvent or foreign materials to enter control through sleeve bushing and PLA shaft area.

b. Install shaft seal in sleeve bushing as follows:

CAUTION

Avoid damaging shaft seal sealing lips during seal installation.

(1) Lubricate shaft seal(12, figure 3) with VV-P-236 petrolatum, or equivalent.

(2) Install new PN 2638219 shaft seal(12, figure 3), over shaft(13) and in bushing (see figure 4). Use two tongue depressors, or equivalent, to quide and push seal in bushing. Ensure that seal is fully seated.

(3) Install new PN 2638218 shaft-seal support(11, figure 3) over shaft and in seal. Flange support shall be on side away from vee side of seal.(See figure 4.)

(4) Install seal cover(1, figure 5) over PLA shaft(2) and on PLA housing assembly(3).

(5) Secure cover using short hex socket head cap screw(4).

(6) Torque screw to 10 to 15 lb-in. over running torque.

(7) Install long hex socket head cap screw(5) in slotted hole in seal cover(1).

(8) Torque screw to 10 to 15 lb-in. over running torque.

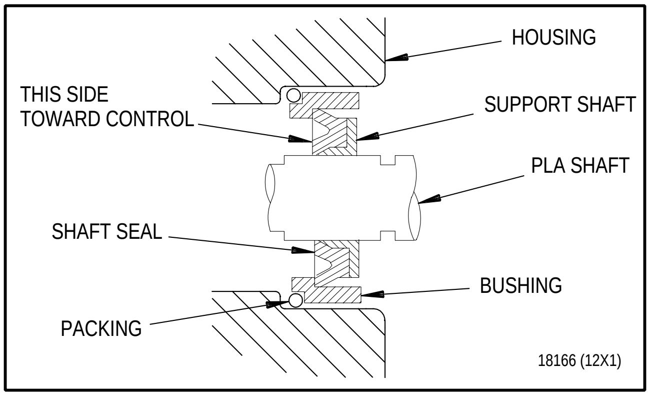


Figure 4. Seal and Support - Installation

CAUTION

Blind spline on shaft must mate with blind spline on lever.

c. Deleted.

d. Install PLA rigging lever on shaft.

WARNING

Engine start before installation of rig pin could allow engine to auto-accel to MAX causing injury or death to personnel.

CAUTION

Omitting installation of rig pin may damage internal PLA cam lever assembly.

(1) Install PWA 52419 rigging pin(1, figure 6) in slot of lever(2) and at 16.5° PLA position in PLA housing assembly(3).

(2) Retain PLA rigging lever(2) using new PN 2628856 self-locking nut(4).

(3) Torque nut to 55 to 60 lb-in. over running torque.

(4) Secure lever(2) using 12-point machine screw(5).

(5) Torque screw to 10 to 15 lb-in.

(6) Remove rig pin(1).

(7) Lockwire screw(1, figure 7) to lever(2) as follows. Use 0.026 inch lockwire(3).

(a) Start lockwire at hole in rigging lever(2) twisting lockwire to hole in screw(1).

(b) Insert lockwire through hole in screw(1) twisting wire approximately five turns.

(c) Twist lockwire around lever(2) and back to screw(1), and twist lockwire.

(d) After lockwiring, move PLA rigging lever(2) and check for interference. None permissible.

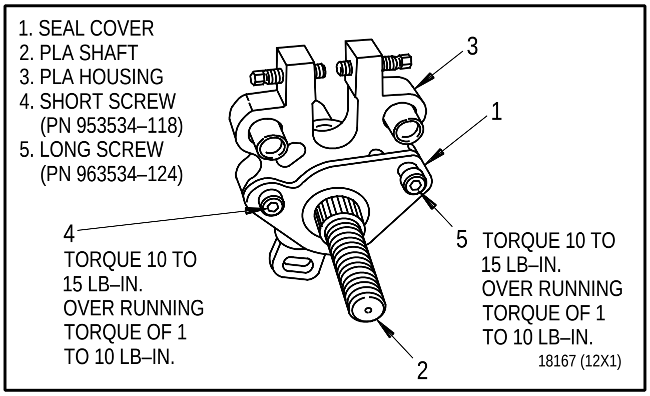


Figure 5. Seal Cover - Installation

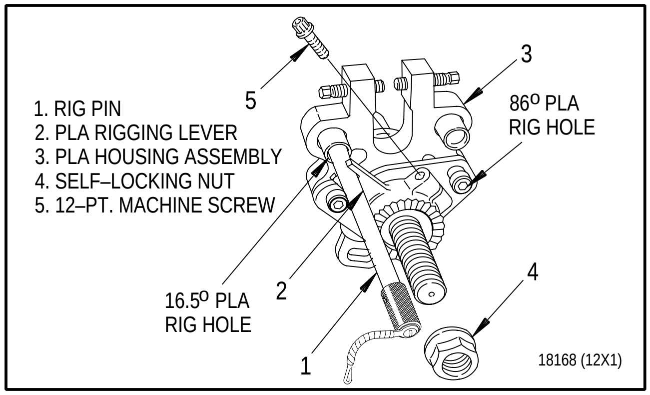


Figure 6. PLA Rigging Lever - Installation

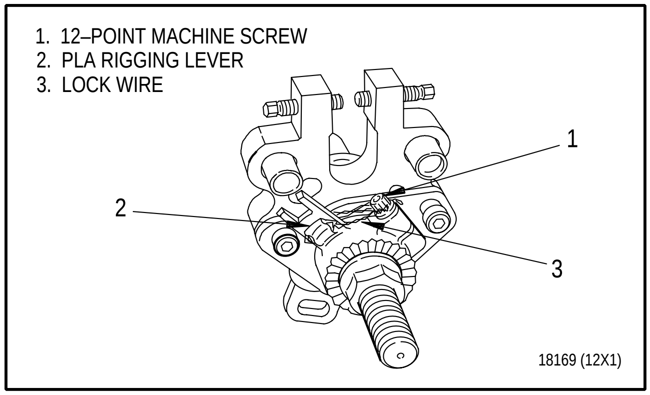


Figure 7. Lever Retaining Screw - Lockwiring

NOTE

One side of adapter has 25 teeth; other side has 24 teeth.

e. Install coupling adapter(1, figure 8) over shaft with 24-tooth side towards control, ensuring that alignment of alignment mark is maintained.

NOTE

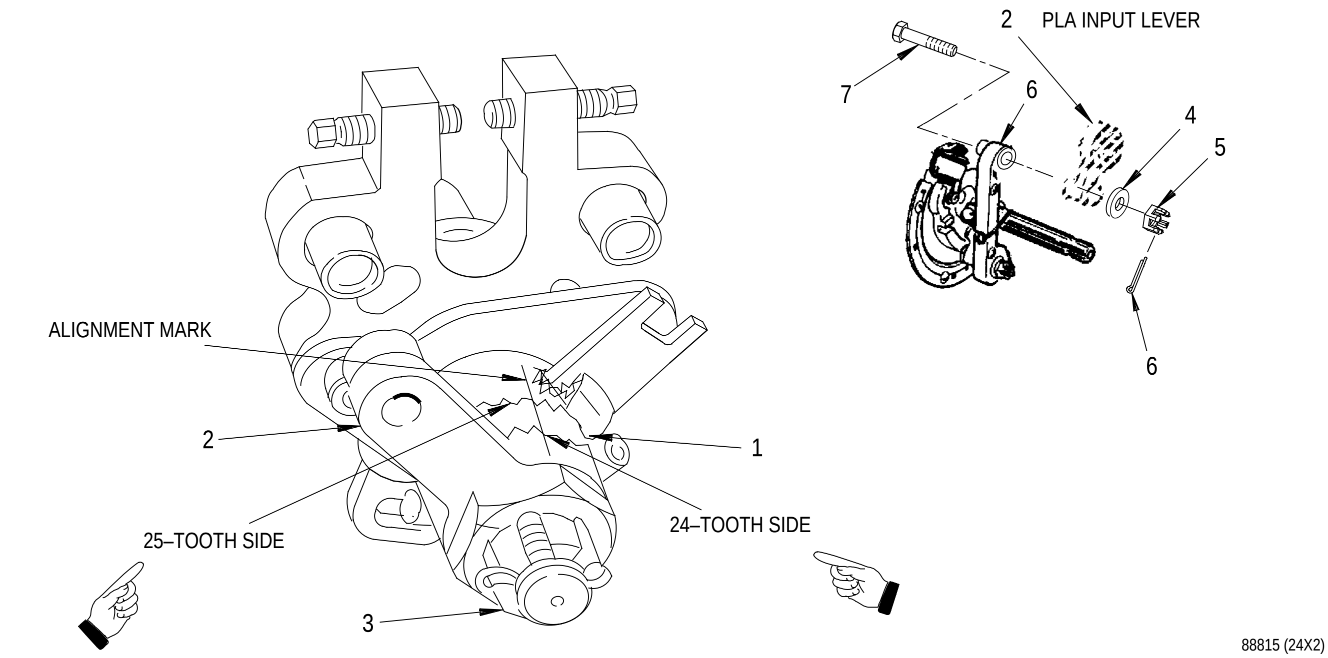
Alignment mark on both levers and coupling adapter shall align as when disassembled.

f. Install PLA input lever(2) on PLA shaft and against coupling adapter(1), ensuring alignment mark position is maintained. Reattach PLA input lever(2) to throttle link assembly(6) by attaching shim(4) and hex nut(5) to self-retaining bolt(7).

CAUTION

Nut will be torqued during following procedure to prevent internal damage to main fuel control.

g. Finger-tighten hex nut(5) and castellated hex nut(3).



1. Coupling adapter
2. PLA input lever
3. Castellated hex nut
4. Shim
5. Hex nut
6. Throttle link assembly
7. Self-retaining bolt
8. Cotter pin (PN 953522-151)

Figure 8. PLA Input Lever - Installation

WARNING

Engine start before installation of rig pin could allow engine to auto-accel to MAX causing injury or death to personnel.

CAUTION

Omitting installation of rig pin may damage internal PLA cam lever assembly.

h. Install PN 2563632 PLA rig pin (1, figure 9) in slot of PLA rigging lever(2) and 16.5° PLA rig-pin hole in PLA housing assembly(3).

i. Torque castellated hex nut(4) to 90 to 130 lb-in. until cotter pin hole in PLA shaft aligns with slots in castellated hex nut.

j. Torque hex nut(5, figure 8) 20 to 30 lb-in. until cotter pin hole in self-retaining bolt(7) aligns with slot in hex nut(5).

k. Install PN 2563632 throttle lever rig pin(5) and ensure rig pin fits freely in 16.5° PLA slot of rigging assembly plate(6).

l. If rig-pin points check is satisfactory, remove rig pin from control. If check is unsatisfactory, reject control.

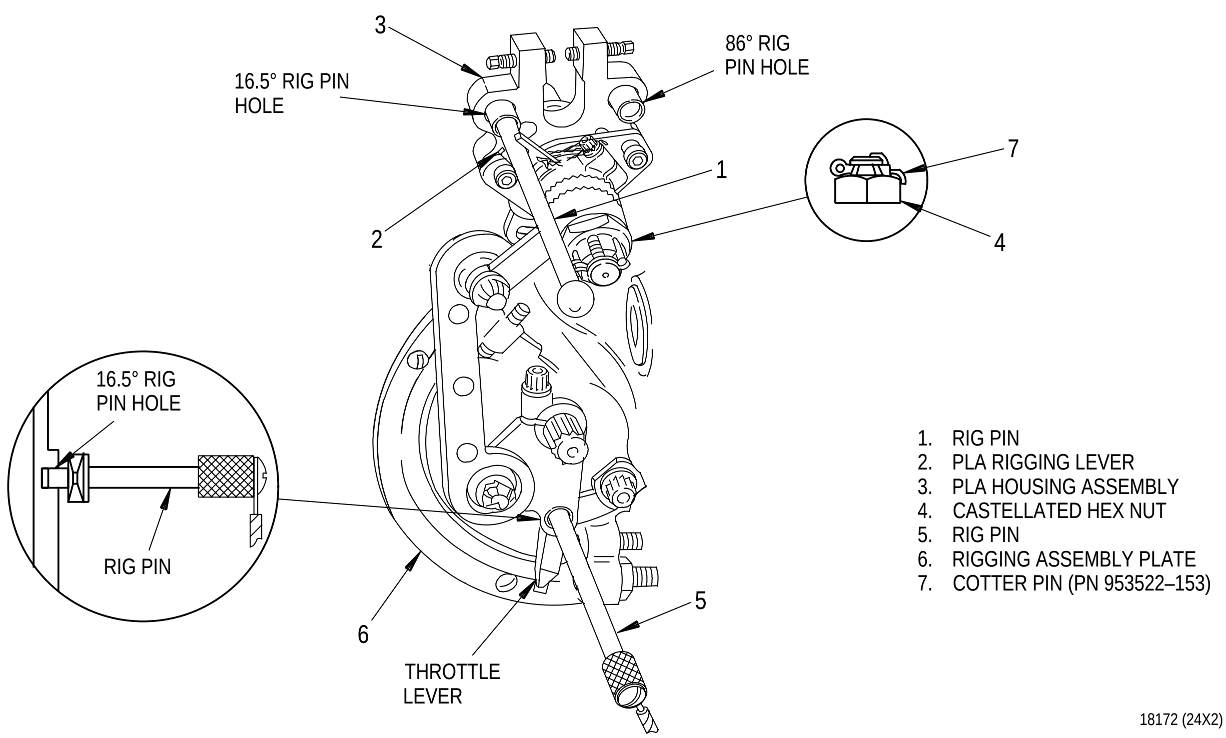


Figure 9. PLA Rigging Pin Positions

m. Install a new PN 953522-153 cotter pin(7, figure 9) through slots in castellated hex nut(4) and hole in PLA shaft.

n. Spread cotter pin tangs with long leg being bent over shaft and short leg down on nut. Lockwire nut using 0.026 lockwire.

o. Install new PN 953522-151 cotter pin(8, figure 8) through slot in the hex nut(5) and hole in self-retaining bolt(7).

p. Spread cotter pin tangs, with long leg bent over bolt end and short leg on nut. Lockwire nut using 0.026 lockwire.

q. Lubricate and install new PN 2670890-5 packing(2, figure 10) on purge-and-drain plug(1).

r. Install purge-and-drain plug.

s. Torque plug to 20 to 25 lb-in. Lockwire plug using 0.026 inch lockwire.

t. Perform leak check of main fuel control. Refer to T.O. 2J-F100-41-2, WP 006 00.

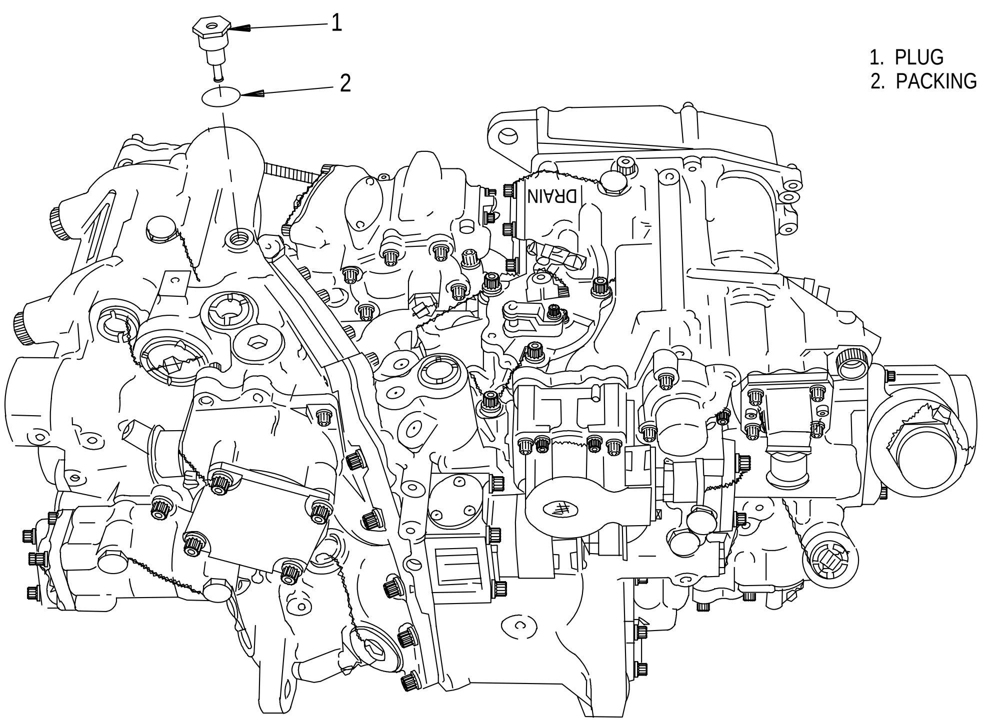


Figure 10. Main Fuel Control - Lockwiring

SUBORDINATE WORK PACKAGE

TECHNICAL PROCEDURES

SHAFT, RCVV FEEDBACK, MAIN FUEL CONTROL

SEAL REPLACEMENT

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE SWP PAGES

Total Number of Pages in this SWP is 10

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 9	12	10 Blank	12		

REFERENCE MATERIAL REQUIRED

Title	Number
Operation and Service Instructions Intermediate Engine Test Engine Testing Requirements -	T.O. 2J-F100-51-1 WP 032 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Cloth, dry lint-free	-
Dental pick (or equivalent)	-
Lockwire (0.025 inch diameter)	MS9226-03
Petrolatum	VV-P-236
Solvent, Dry-cleaning	P-D-680

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Packing	Bendix 2670890-5	1
Shaft seal	Bendix 2638219	1
Shaft seal support	Bendix 2638218	1

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This subordinate work package contains instructions for replacement of RCVV shaft seal in turbine engine main fuel control.

2. SHAFT SEAL - REMOVAL.

(See Figures 1 through 4.)

NOTE

- RCVV feedback shaft seal replacement can be accomplished with the main fuel control mounted on engine.
- RCVV feedback cable shall be disconnected per WP 009 00 prior to shaft seal replacement.

a. Cut and remove lockwire from control locations (1 and 3, figure 1) as shown. Do not remove seal and lockwire from opposite end of lever(2, figure 2).

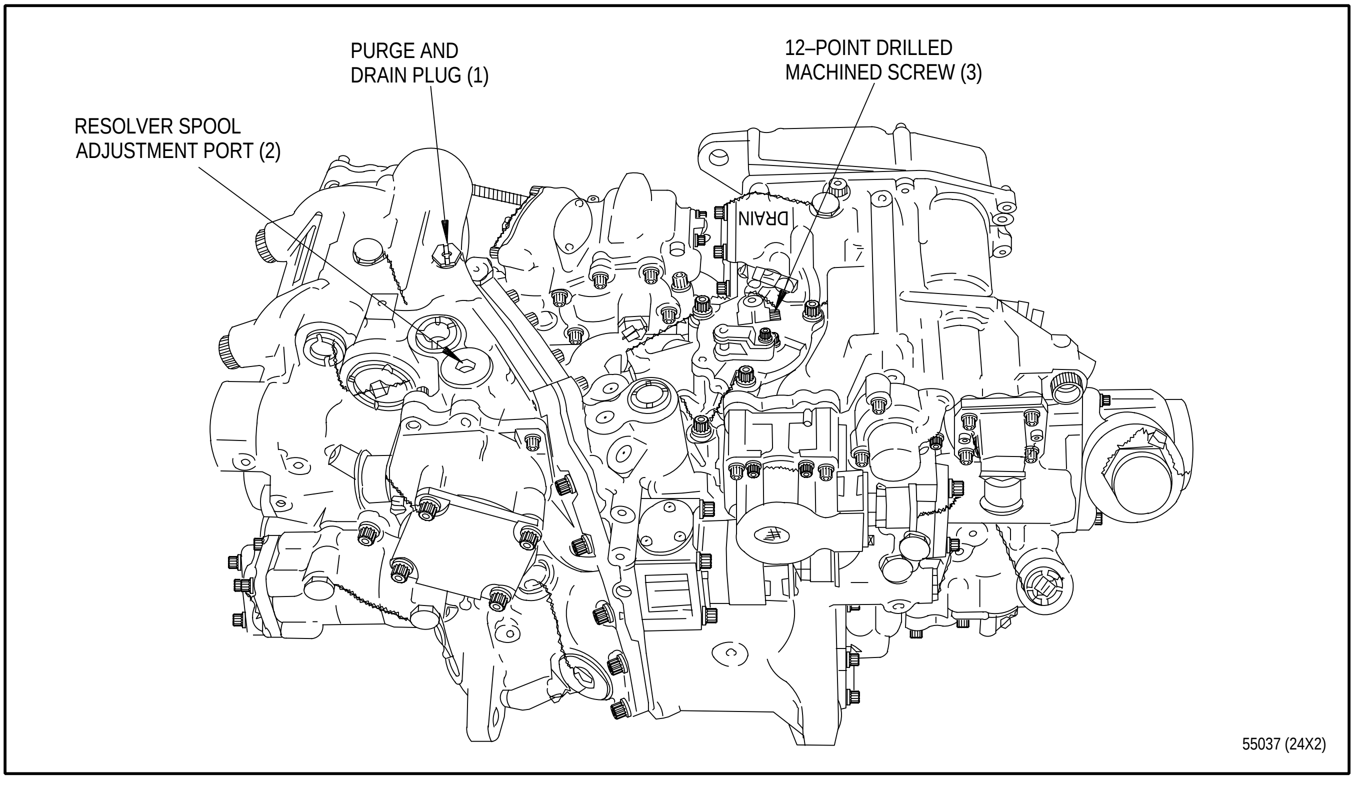


Figure 1. Purge and Drain Plug

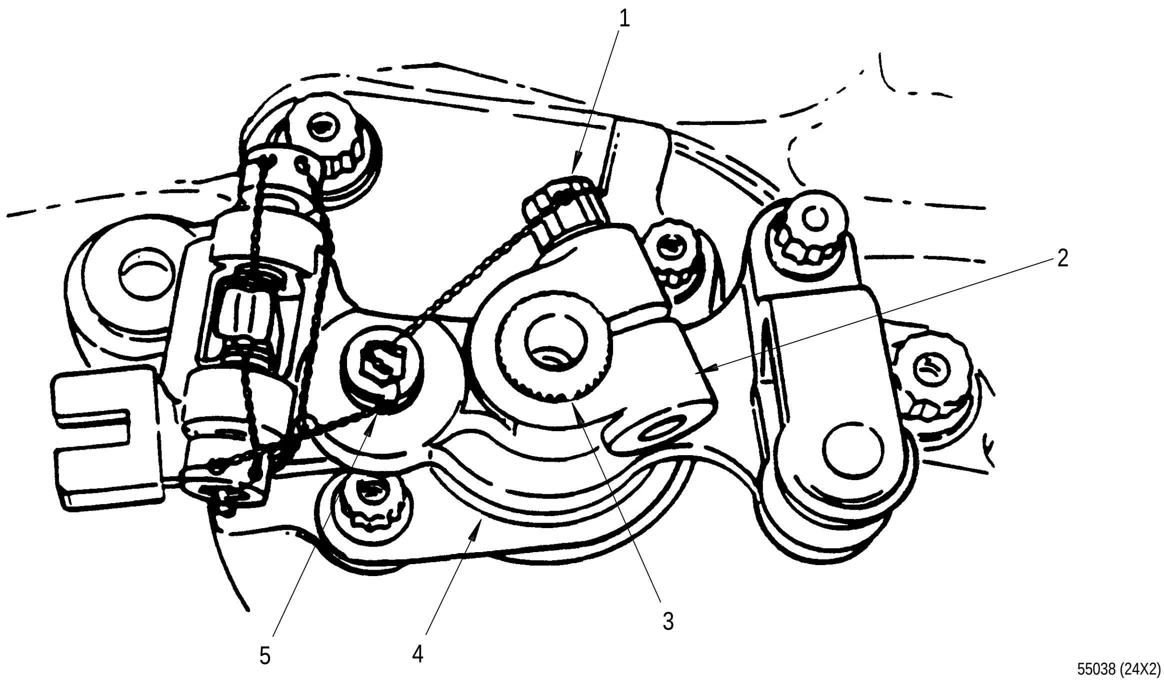


Figure 2. RCVV Feedback Lever Assembly

b. Remove purge and drain plug and packing from control body. Drain all residual fluid from control. Discard packing.

c. Remove screw (1, figure 2) from lever(2).

CAUTION

Avoid damaging surface of shaft(3) while removing support and seal. Depot repair will result.

(1) Turn shaft(3) slightly clockwise to relieve spring pressure and remove lever assembly as a group. Allen wrench (5/32-inch) may be used in center of shaft to turn it.

(2) Slowly allow shaft to rotate counterclockwise until rotation stops.

(3) Remove washer(4).

(4) Remove screws(1, figure 3) and retainer(2).

(5) Remove seal support(1, figure 4) and seal(2) with dental pick or equivalent. Discard seal support and seal.

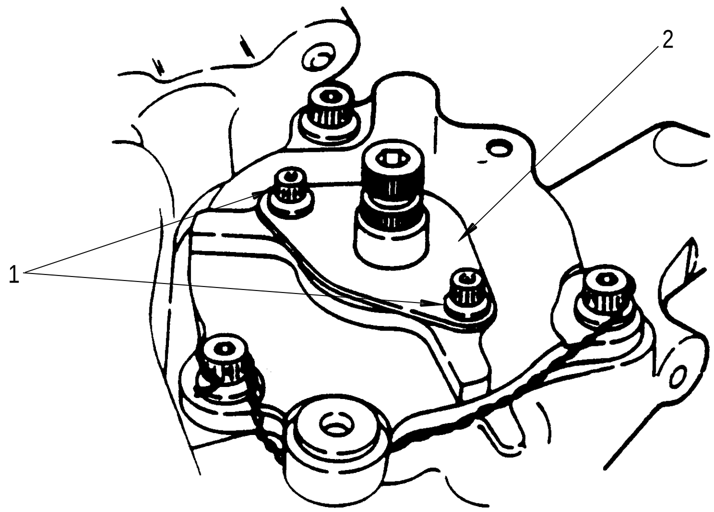


Figure 3. Shaft Seal and Retainer

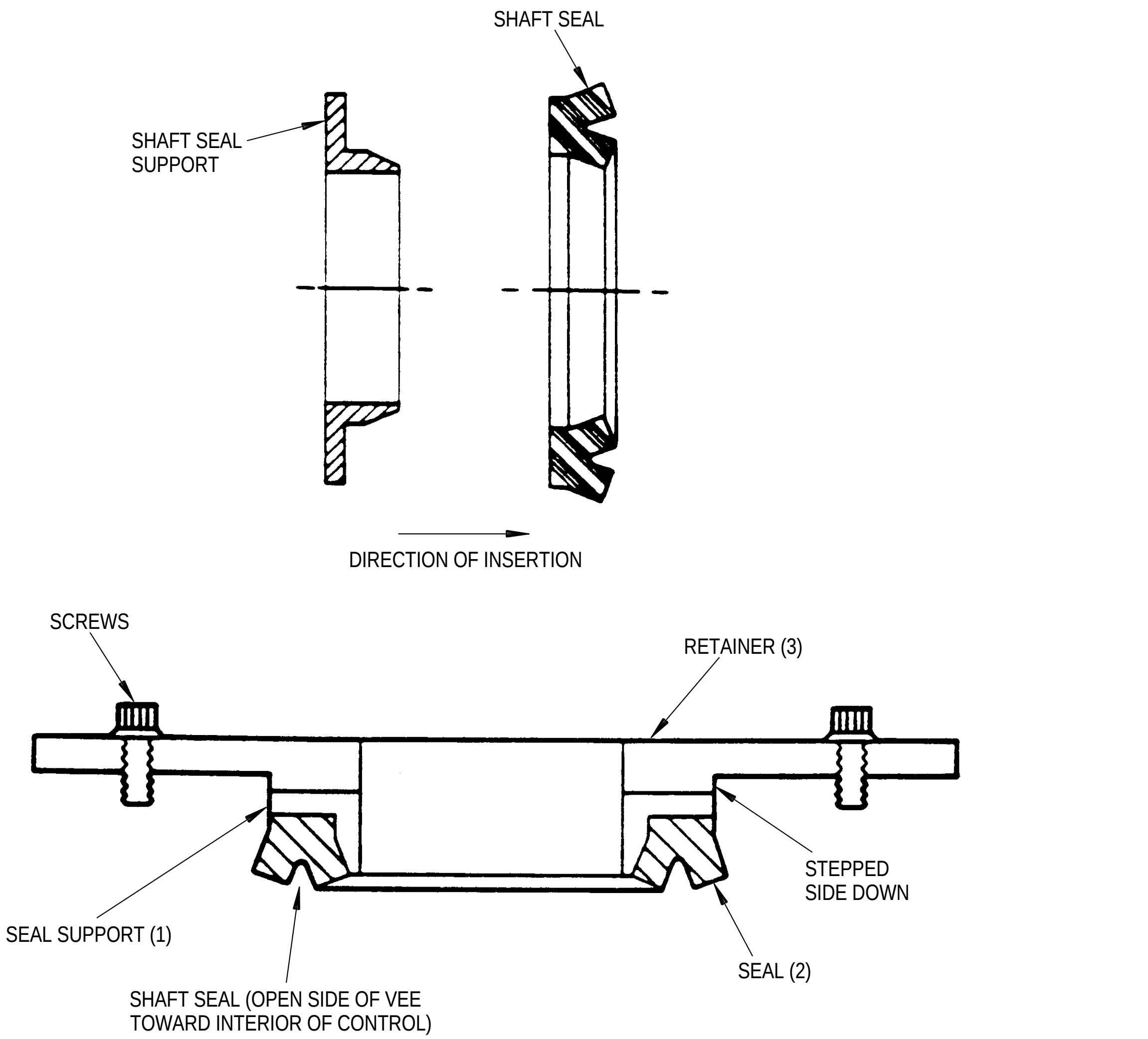


Figure 4. Retainer, Shaft Seal and Support - Installation

3. SHAFT SEAL - INSTALLATION.

(See figures 1 through 4. See Figure 5.)

a. Remove any foreign material deposited on RCVV feedback shaft(3, figure 2) or in cavity of RCVV feedback cover assembly (figure 4). Use clean, lint-free cloth and P-D-680 cleaning solvent. Do not allow solvent or foreign materials to enter control through the cover assembly cavity and feedback shaft area.

b. Install shaft seal in RCVV feedback cover assembly as follows:

CAUTION

Use care during installation to avoid damaging or rolling shaft seal sealing lips.

(1) Lubricate shaft seal with VV-P-236 petrolatum. Install shaft seal(2) over shaft and into feedback cover assembly as shown in figure 4. Carefully press seal into place.

NOTE

Flange support shall be on side away from vee side of seal.

(2) Install shaft seal support(1), over shaft and into seal. Press into place.

(3) Install retainer(3) stepped side down.

(4) Install screws(1, figure 3) to secure retainer.

(5) Torque screws 11 to 25 pound-inches.

c. Install lever assembly on shaft as follows:

(1) Place washer(4, figure 2) over end of shaft(3).

(2) Align blind spline on shaft(3) with blind spline in lever(2) and install.

(3) Using Allen wrench (5/ 32-inch), turn linkage slightly clockwise to allow stop on lever to go into recess on cover and seat lever.

(4) Using feeler gage, measure clearance between lever and screw as shown in figure 5. There must be a minimum of 0.005 inch clearance. If required, reposition lever on shaft to obtain necessary clearance.

(5) Install screw(1, figure 2) to retain levers.

(6) Torque screw 10 to 15 pound-inches.

(7) Turn shaft clockwise until lever just contacts maximum stop. Lever should move smoothly without dragging or binding from stop to stop.

d. Lockwire screw(1, figure 2) as follows:

(1) Start wire at screw(1) and twist wire to unused hole in screw(5) holding levers together.

(2) Insert wire through unused hole and tie wire.

e. Install purge and drain plug as follows:

(1) Install packing on purge and drain plug.

(2) Install purge and drain plug(1, figure 1) and packing into the control. Torque plug 25 to 30 pound-inches.

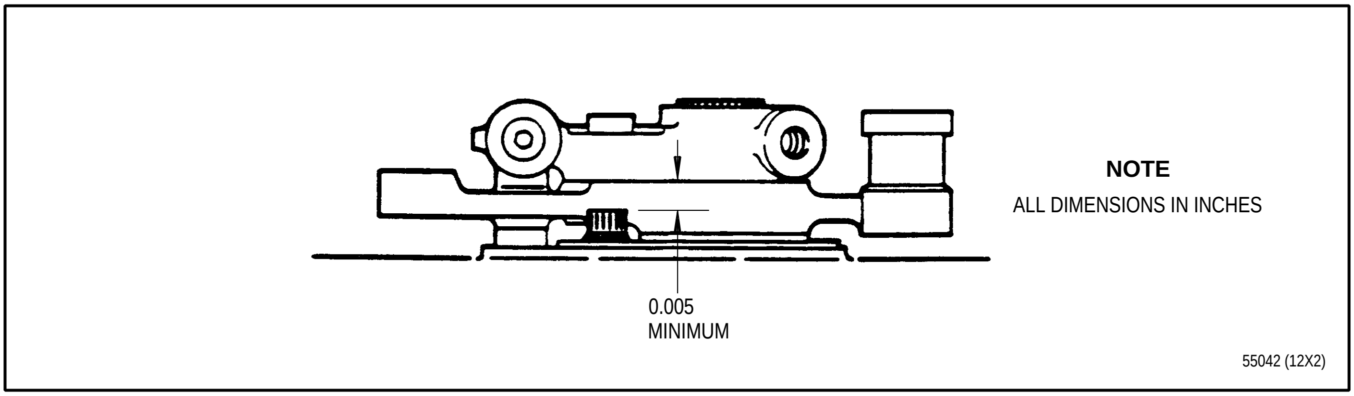


Figure 5. RCVV Feedback Adjusting Lever Clearance

f. Lockwire purge and drain plug as follows:

(1) Start wire at metering valve resolver spool adjustment port plug(2, figure 1) and twist to purge and drain port plug(1).

(2) Insert wire through hole in purge and drain plug and tie wire.

g. If main fuel control is mounted on engine, reconnect RCVV feedback cable.

h. Perform leak check of main fuel control. Refer to T.O. 2J-F100-51-1, WP 032 00.

WORK PACKAGE

TECHNICAL PROCEDURES

CONTROL - FUEL, AUGMENTOR

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 38

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	22	14 - 21	0	28	0
2	0	22 - 25	1	29	22
3	3	26	0	30 - 36	0
4 - 12	0	27	22	37	6
13	6			38 Blank	6

REFERENCE MATERIAL REQUIRED

Title	Number
Engine Test	T.O. 2J-F100-11-2
Engine Test Requirements	WP 206 00
Engine Leak Check and Gaspath Inspection	WP 302 00
Introduction and General Information	T.O. 2J-F100-53-1
General Intermediate Maintenance Procedures	WP 021 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Alcohol or	O-E-760, Type III
Trichloroethane inhibitor 1,1,1	O-T-620
Cloth, dry lint-free	-
Compound, antigalling (PWA 550)	Hi-T-650 or Lubri-Bond HT
Lockwire (0.032 inch diameter)	MS9226-04
Material, barrier	MIL-B-121, Type II, Grade A, Class I
Oil, lubricating	MIL-L-6081, Grade 1005 or 1010
Oil, lubricating	MIL-L-7808
Petrolatum	VV-P-236
Solvent, petroleum	P-D-680, Type II

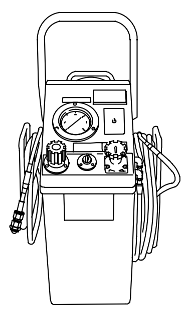
EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Gasket	4075770	1
Packing, preformed	MS9966-04	3
Packing, preformed	MS9966-05	4
Packing, preformed	MS9967-18	1
Packing, preformed	MS9967-222	1
Packing, preformed	M25988/2-011	11

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
15	Augmentor Fuel Control - Leak Check	
	Tester - Hydraulic pressure -------	PWA 50096
	Adapter, Inlet ----------------	GS22039-1

ILLUSTRATED SUPPORT EQUIPMENT



PWA 50096 –C

Figure T1. PWA 500096 Hydraulic Pressure Tester

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures for the augmentor fuel control:

- Removal
- Removal of attaching parts
- Cleaning
- Inspection
- Installation of attaching parts
- Installation
- Ignition relay assembly - Replacement
- Segment sequencing EHV - Replacement
- Duct metering valve EHV - Replacement
- Core metering valve EHV - Replacement
- Segment select resolver assembly - Replacement
- Duct metering valve resolver assembly - Replacement
- Core metering valve resolver assembly - Replacement
- Leak check
- Storage and shipment

2. AUGMENTOR FUEL CONTROL - REMOVAL.

(See Figures 1, 2, and 3.)

a. Disconnect electrical connectors P97, P98, P99, P100, P101, P102, P103, and P104 from augmentor fuel control. (See figure 1.)

b. Place a container under augmentor fuel control to catch fuel as tubes and hoses are disconnected.

c. Disconnect tubes and hoses from augmentor fuel control. (See figure 2.) Discard packings.

d. Loosen coupling nut(2) on augmentor fuel pump signal tube(1) (PF3AR) to facilitate control removal.

e. Support augmentor fuel control and remove bolts, washers, and nuts that secure control to fuel control support link and fuel control outlet manifold. (See figure 3.)

f. Discard fuel control manifold gasket.

g. Remove bolts and nuts securing fuel control outlet manifold to fan duct brackets. Remove manifold.

h. Place protective closures over augmentor fuel control receptacles and over electrical connectors P97, P98, P99, P100, P101, P102, P103, and P104.

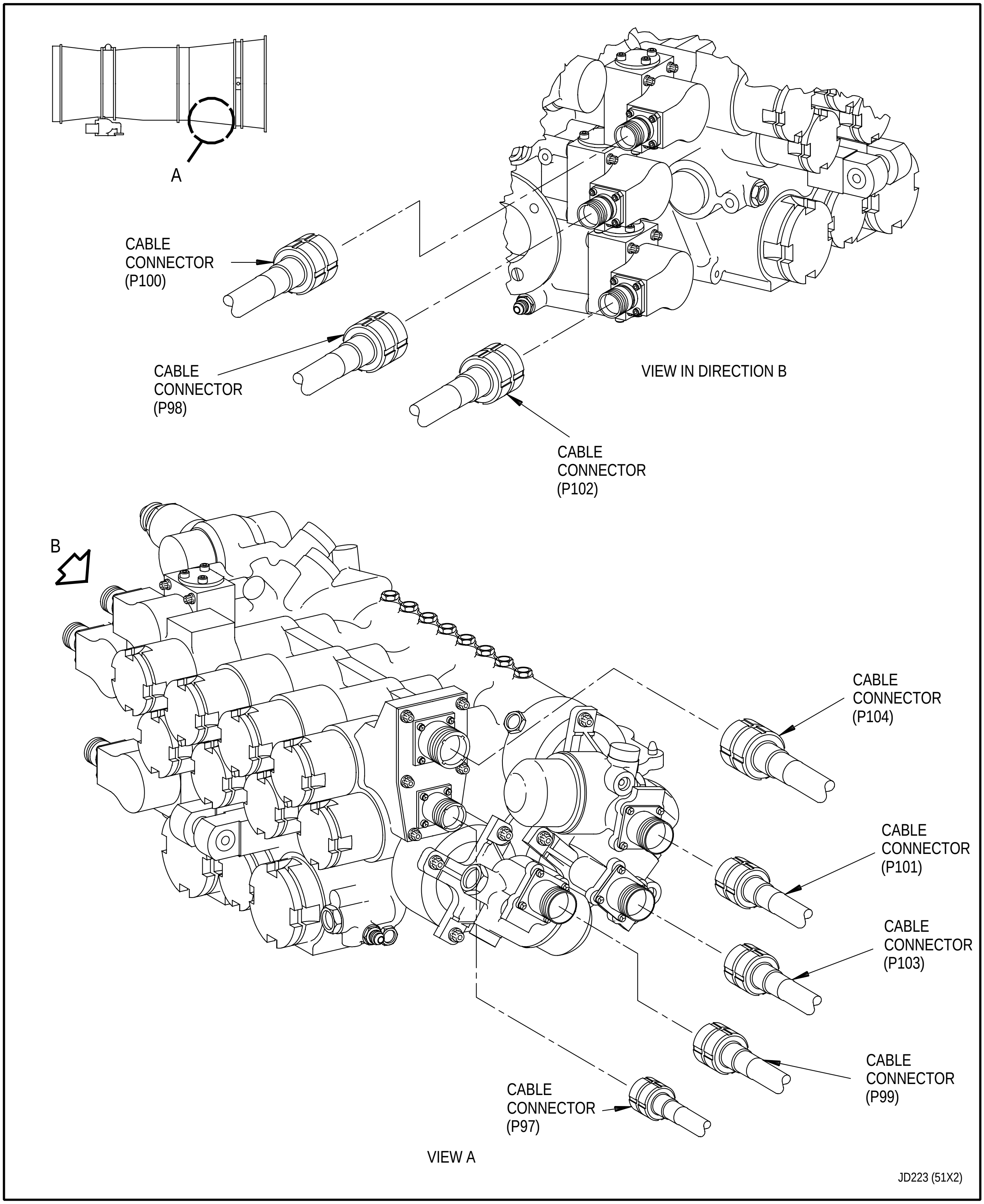
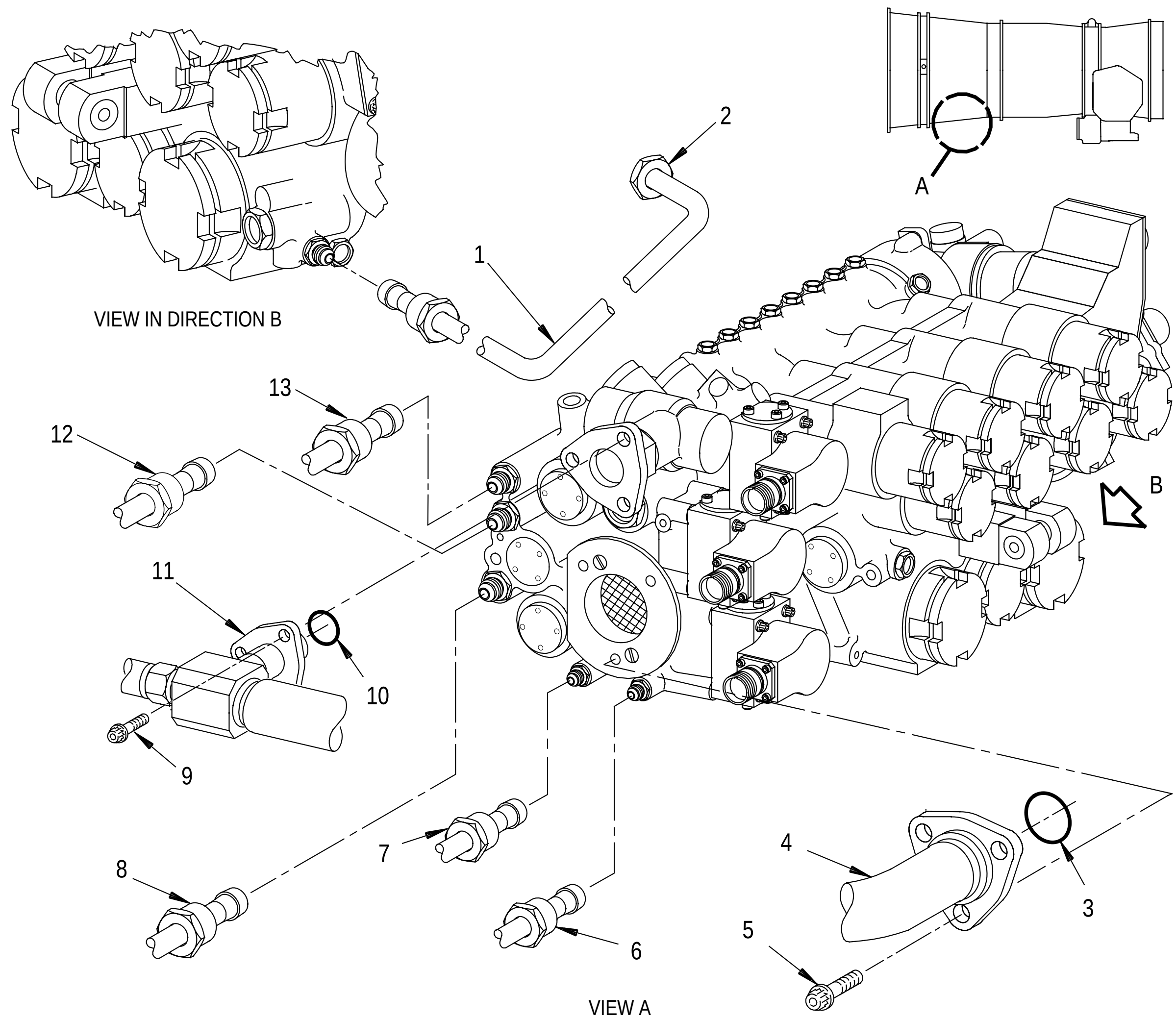


Figure 1. Augmentor Fuel Control - Disconnect of Electrical Connectors



1. AUGMENTOR PUMP CONTROL FUEL SIGNAL TUBE ASSEMBLY (PF3AR)
2. COUPLING NUT
3. PACKING
4. HOSE ASSEMBLY (PFIACI)
5. BOLT
6. AUGMENTOR AND MAIN FUEL CONTROL PFMO, FRONT MANIFOLD ASSEMBLY (PFMO)
7. AUGMENTOR PUMP CONTROL FUEL SIGNAL TUBE ASSEMBLY (PFIAW)
8. AUGMENTOR PUMP CONTROL FUEL SIGNAL TUBE ASSEMBLY (PFPC)
9. BOLT
10. PACKING
11. HOSE ASSEMBLY (PFI)
12. AUGMENTOR PUMP CONTROL FUEL SIGNAL TUBE ASSEMBLY (PFAP)
13. HOSE ASSEMBLY (PF1SM)

JD224X2 (51X2)

Figure 2. Augmentor Fuel Control - Disconnecting Tubes and Hoses

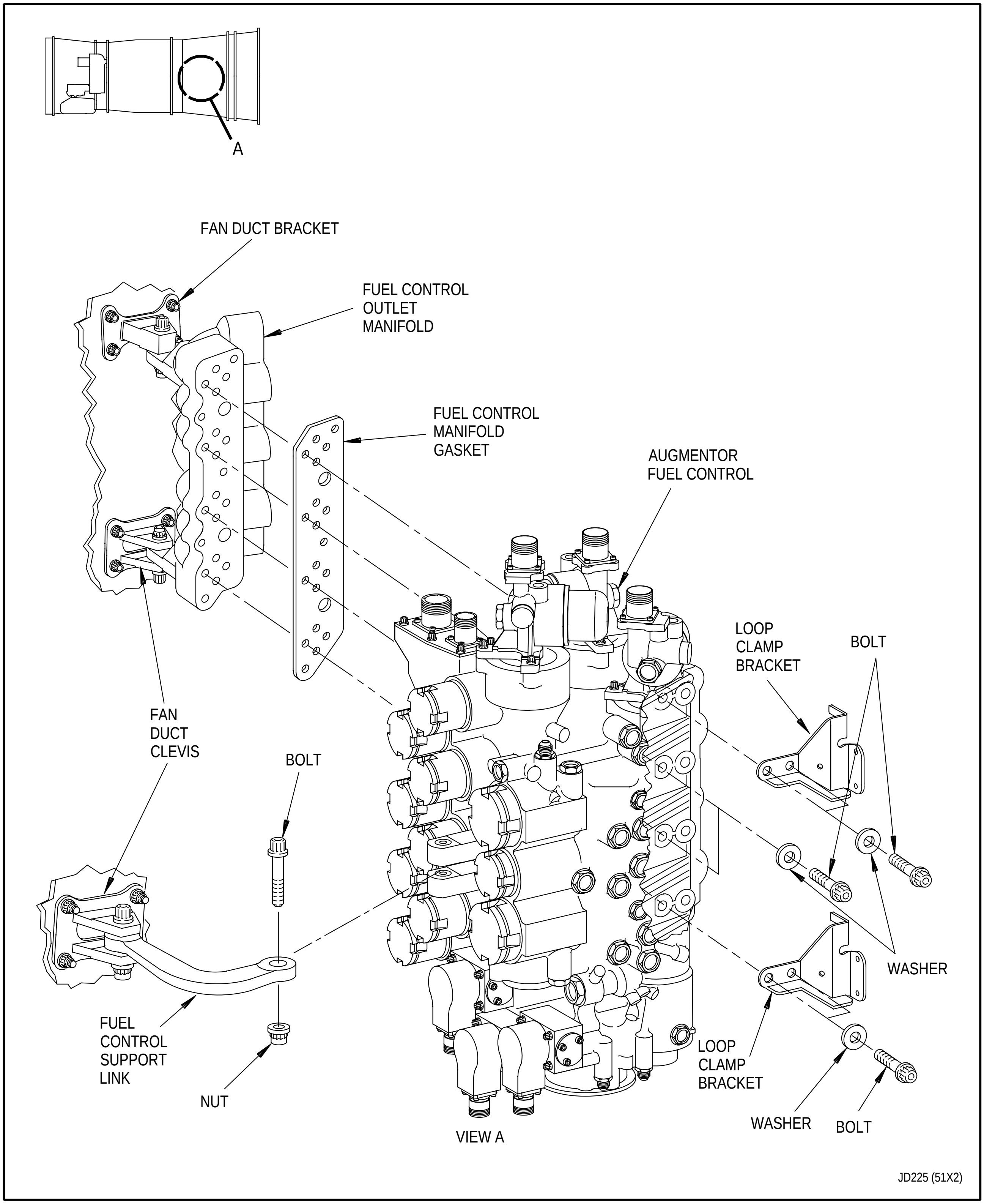


Figure 3. Augmentor Fuel Control - Removal

3. AUGMENTOR FUEL CONTROL - REMOVAL OF ATTACHING PARTS.

(See Figure 4.)

a. Remove adapters from augmentor fuel control as shown in figure 4. Discard all packings. Install protective closures.

4. AUGMENTOR FUEL CONTROL - CLEANING.

a. Wipe exterior of augmentor fuel control with a clean cloth moistened with P-D-680, Type II petroleum solvent. Install protective closures.

b. Wipe control dry with clean, dry lint-free cloth.

c. Clean electrical connector pins and sockets with O-E-760, Type III alcohol or Trichloroethane inhibitor - 1,1,1 O-T-620.

d. Dry with clean compressed air at less than 30 psig.

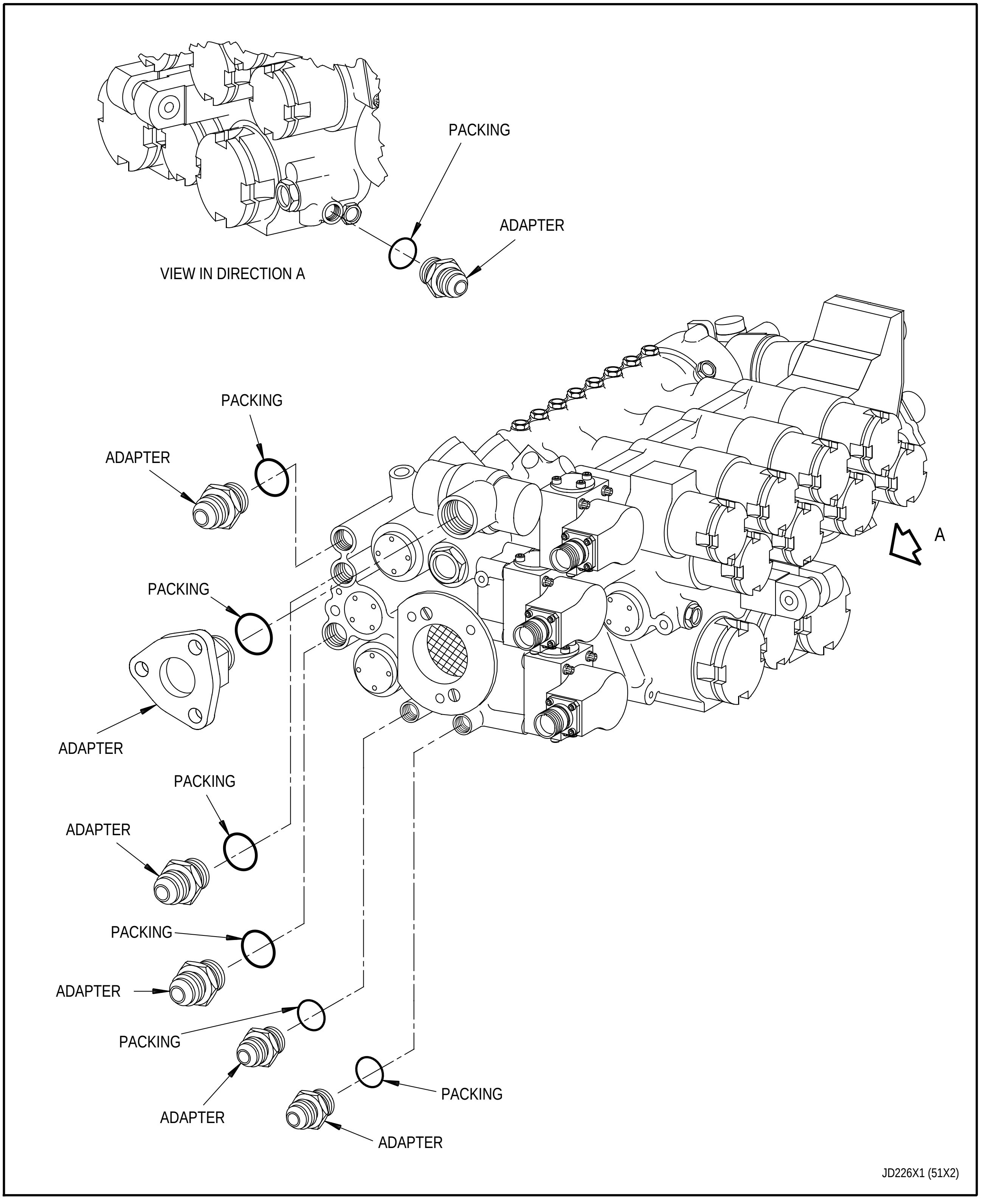
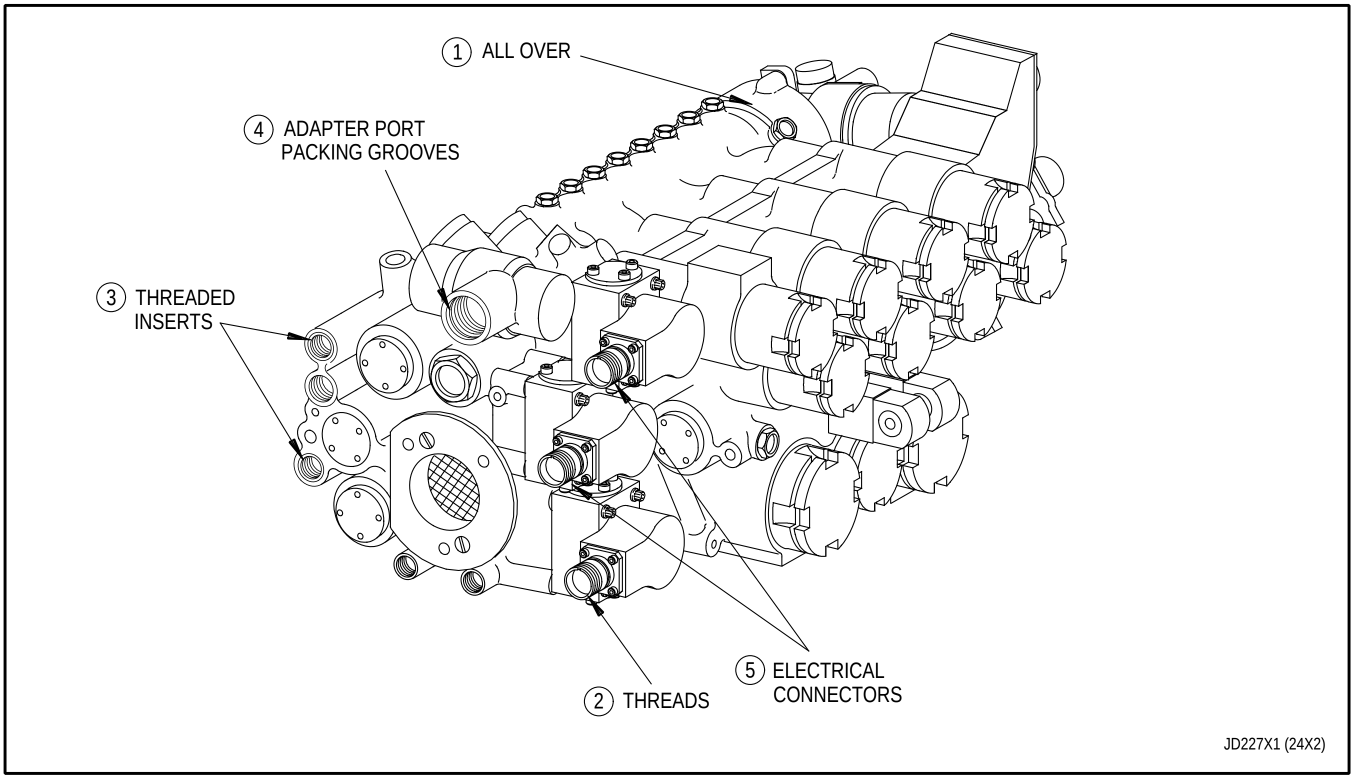


Figure 4. Augmentor Fuel Control - Removal of Attaching Parts

5. AUGMENTOR FUEL CONTROL - INSPECTION.
(See Figure 5.)

a. Inspect augmentor fuel control. (See figure 5.)

b. Inspect electrical connectors. Refer to T.O. 2J-F100-53-1, WP 021 00.



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. All over - Wear, corrosion, cracks, dents, or signs of leakage	Not serviceable	Not reparable	Replace control.

Figure 5. Augmentor Fuel Control - Inspection

Legend for figure 5 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
2. Threads -			
Damage	Not serviceable	Minor damage reparable	Minor thread damage may be repaired using thread die or fine stone.
3. Threaded inserts -			
Looseness	Not serviceable	Not reparable	Replace inserts.
4. Adapter port packing grooves -			
Roughness, wear	Not serviceable	Minor damage reparable	Smooth rough edges or burrs.
5. Electrical connectors -			
Cracked, missing pins	Not serviceable	Not reparable	Replace control.

6. AUGMENTOR FUEL CONTROL - INSTALLATION OF ATTACHING PARTS.
(See Figure 6.)

a. Lubricate preformed packings with MIL-L-7808 or VV-P-236 petrolatum and install on adapters. (See figure 6.)

b. Lubricate threads of adapters with MIL-L-7808 oil and install adapters into augmentor fuel control. Torque adapters. (See figure 6.)

7. AUGMENTOR FUEL CONTROL - INSTALLATION.
(See Figures 7, 8, and 9.)

a. Apply PWA 550 antigalling compound to threads of mounting bolts. (See figure 7, sheet 1.) Remove excess.

b. Install fuel control manifold gasket onto main fuel control.

c. Position augmentor fuel control onto fuel control outlet manifold and fuel control support link on rear fan duct. Install bolt and nut fingertight.

d. Install bolts and washers fingertight in fuel control outlet manifold and fuel control support link.

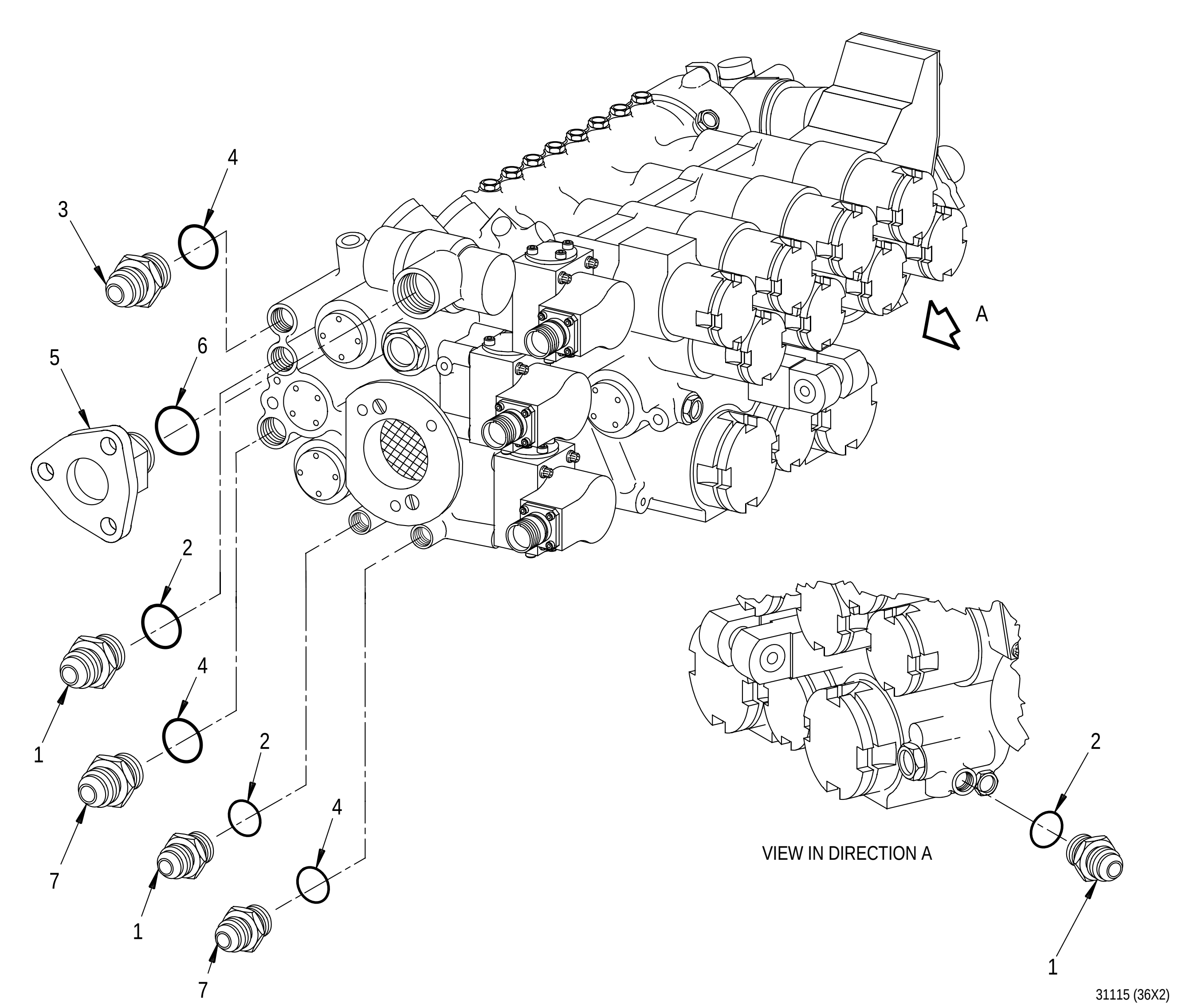
e. Torque nut securing augmentor fuel control to supporting link. (See figure 7, sheet 1.)

f. Torque bolts securing augmentor fuel control to fuel control outlet manifold 40 to 45 pound-inches.

(1) Torque bolts in sequence shown in figure 7, Sheet 2.

(2) Continue torquing bolts to 80 to 90 pound-inches in sequence shown in figure 7, sheet 2.

(3) Final torque bolts to 125 to 140 pound-inches in sequence shown in figure 7, sheet 2.



Index number	Description	Lubrication	Torque (LB-IN)
1	Adapter (PN ST2000-04)	Oil	65 to 75
2	Packing (PN MS9966-04)	Oil or Petroleum	
3	Adapter (PN ST2101-061)	Oil	90 to 100
4	Packing (PN MS9966-05)	Oil or Petroleum	
5	Adapter (PN 4074137)	Oil	250 to 275
6	Packing (PN MS9967-18)	Oil or Petroleum	
7	Adapter (PN ST2091-041)	Oil	90 to 100

Figure 6. Augmentor Fuel Control - Installation of Attaching Parts

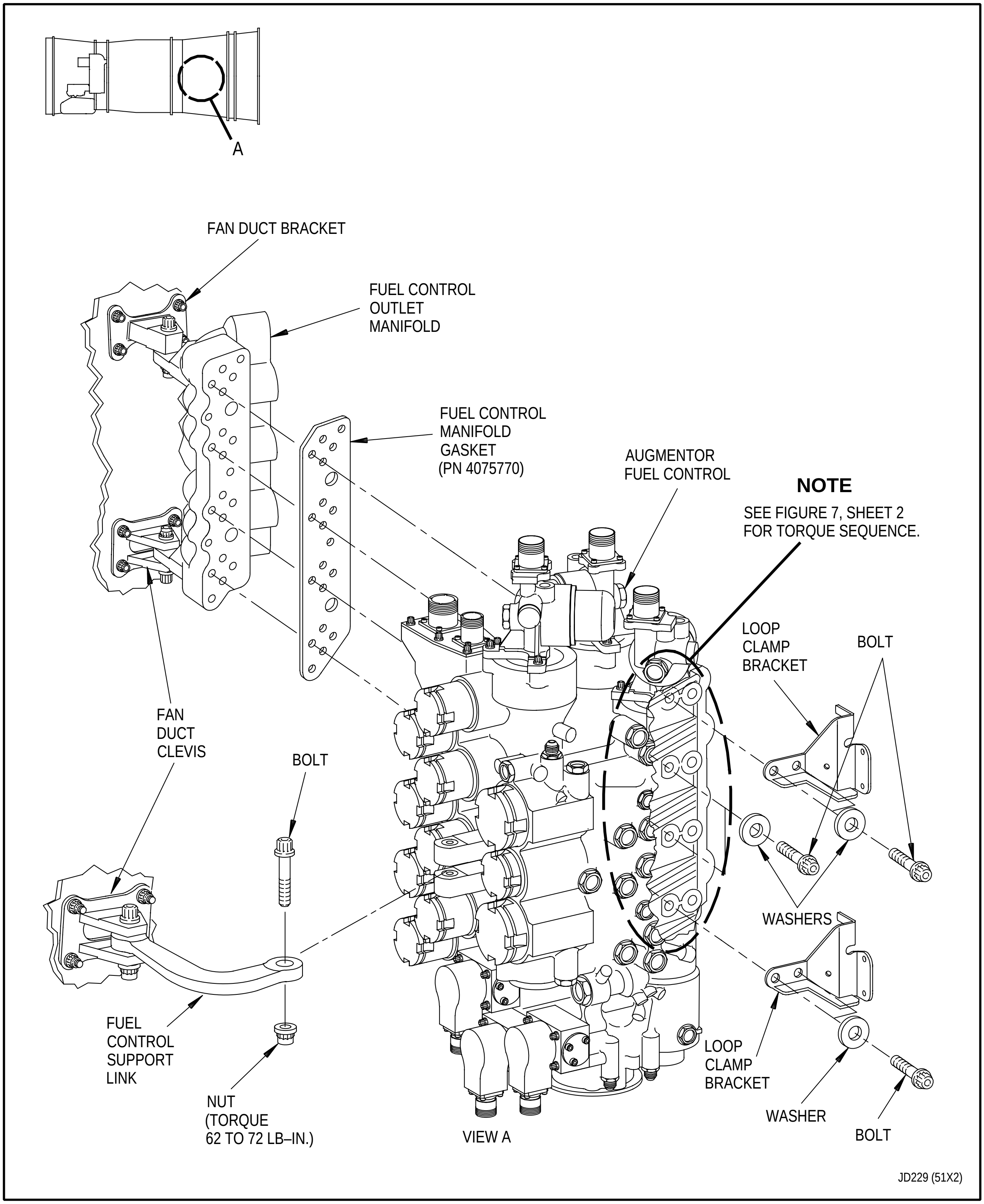


Figure 7. Augmentor Fuel Control - Installation (Sheet 1 of 2)

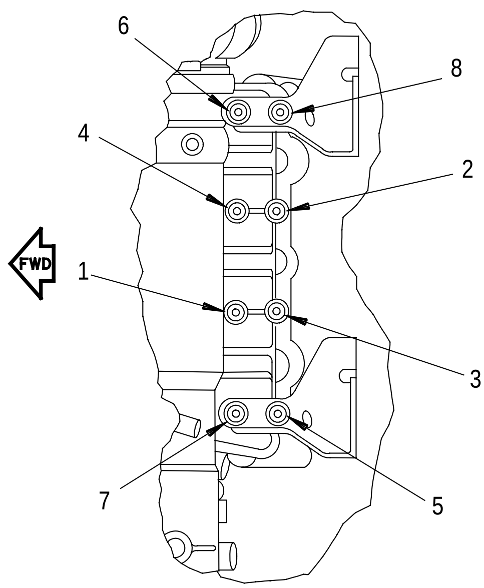


Figure 7. Augmentor Fuel Control - Installation (Sheet 2 of 2)

i. Lubricate preformed packings with MIL-L-7808 or VV-P-236 petrolatum. Install packings. (See figure 8.)

j. Connect and torque tubes and hoses to augmentor fuel control. (See figure 8.)

k. Lockwire using MS9226-04 wire.

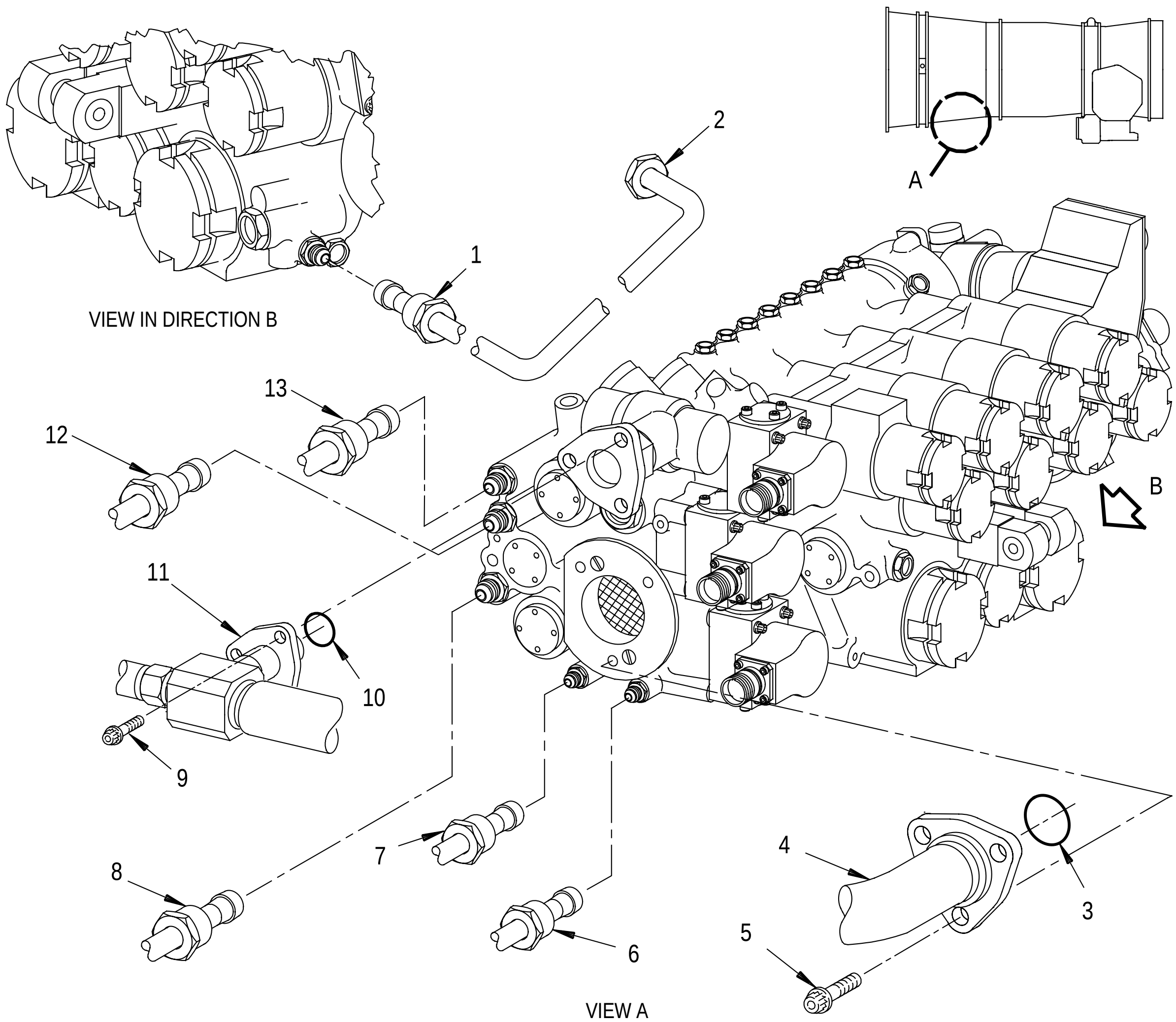
l. Torque coupling nut(2).

m. Connect electrical connectors P97, P98, P99, P100, P101, P102, P103, and P104 to mating receptacles on control as follows: (See figure 9.)

(1) Align keyways and handtighten connector.

(2) Ensure red line on receptacle is not visible when viewed at right angles.

(3) Tighten connector firmly with soft-jawed pliers.



INDEX NUMBER	DESCRIPTION	LUBRICATION	TORQUE (LB-IN.)
1.	TUBE	PWA 550	65 TO 75
2.	COUPLING NUT	PWA 550	65 TO 75
3.	PN MS9967-222 PACKING	OIL	-
4.	HOSE ASSEMBLY	-	-
5.	BOLT	PWA 550	125 TO 140
6.	TUBE NUT	PWA 550	65 TO 75
7.	TUBE NUT	PWA 550	65 TO 75
8.	TUBE NUT	PWA 550	65 TO 75
9.	BOLT	PWA 550	27 TO 30
10.	PN MS9966-05 PACKING	OIL	-
11.	HOSE ASSEMBLY	-	-
12.	TUBE NUT	PWA 550	65 TO 75
13.	TUBE NUT	PWA 550	200 TO 225

JD001575 (51X2)

Figure 8. Augmentor Fuel Control - Connecting Tubes and Hoses

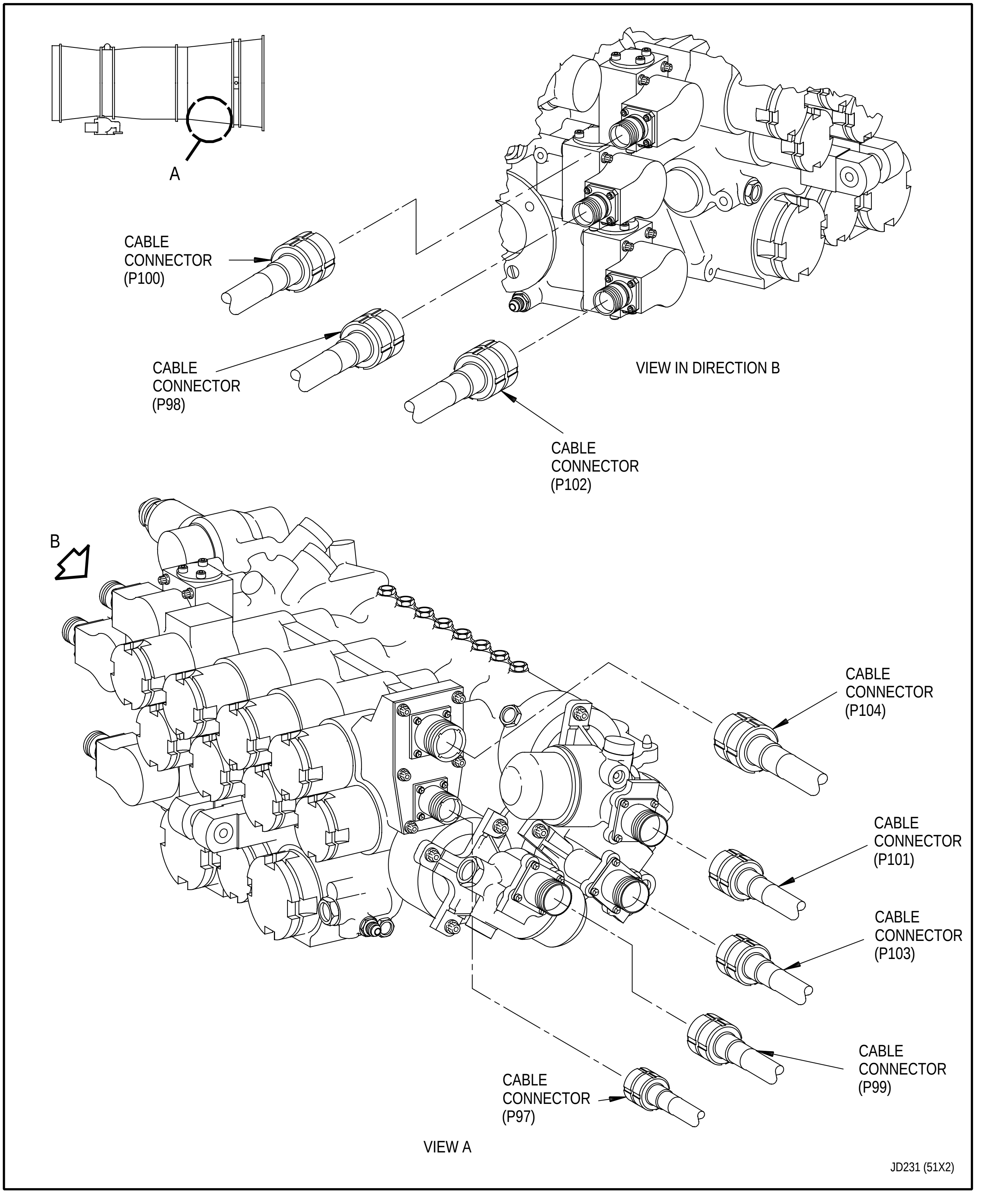


Figure 9. Augmentor Fuel Control - Electrical Connectors

8. IGNITION RELAY ASSEMBLY - REPLACEMENT.

(See Figure 10.)

CAUTION

Contamination of augmentor fuel control will make it unserviceable.

a. Place augmentor fuel control on a clean work bench. Position control so ignition relay assembly can be easily removed. If control is mounted on engine, disconnect electrical connectors P104 and P97.

b. Clean area around switch thoroughly with a clean cloth moistened with P-D-680, Type II petroleum solvent. Blow area dry with clean compressed air at less than 30 psig.

c. Place a container under control to catch any fuel as ignition relay assembly is being removed.

d. Remove bolts(3, figure 10) and washers(2).

e. Remove ignition relay assembly(1).

f. Remove all protective closures from replacement ignition relay assembly, and retain for use on replaced assembly.

g. Apply a light coat of PWA 550 antigalling compound to bolts(3). Remove excess.

h. Install ignition relay assembly(1) on control. Secure with washers(2) and bolts(3) fingertight.

i. Run-in torque required to install bolts(3) into control shall be 2 to 13 pound-inches. Replace bolt if torque is not 2 to 13 pound-inches. If torque still cannot be met, replace control.

j. Final torque bolts(3) 30 to 35 pound-inches in a criss-cross pattern. Ensure ignition relay assembly is firmly seated.

k. If control is mounted on engine, connect electrical connectors P104 and P97 to mating receptacles on ignition relay assembly as follows:

(1) Align keyways and handtighten connector.

(2) Ensure red line on receptacle is not visible when viewed at right angles.

(3) Tighten connector firmly with soft-jawed pliers.

l. If control is mounted on engine, perform leak check. Refer to T.O. 2J-F100-11-2, WP 302 00.

m. Install protective closure parts from replacement ignition relay assembly on unserviceable ignition relay assembly. Pack ignition relay assembly in shipping container.

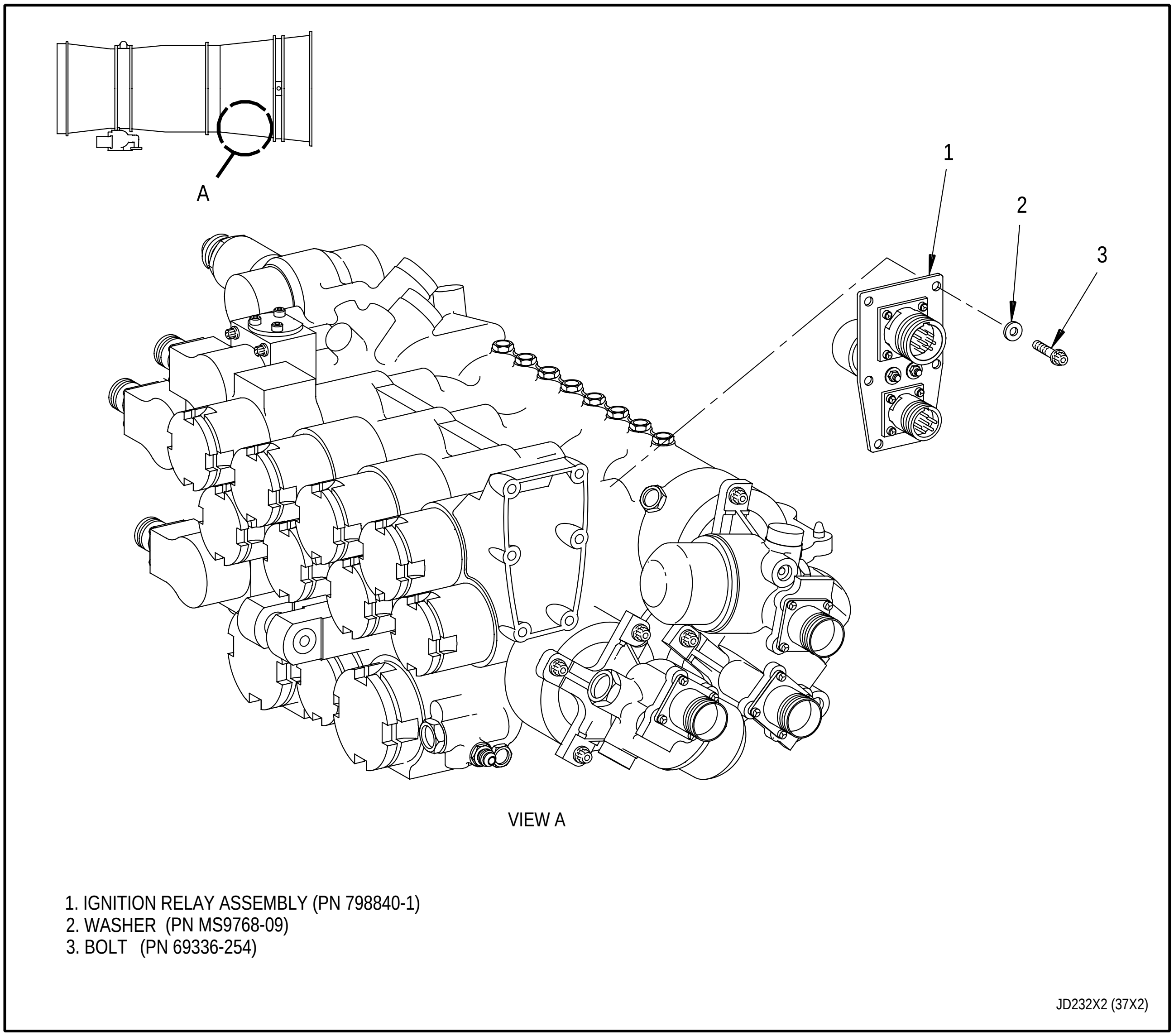


Figure 10. Ignition Relay Assembly - Replacement

9. SEGMENT SEQUENCING ELECTRO-HYDRAULIC SERVO-VALVE (EHV) - REPLACEMENT.
(See Figure 11.)

CAUTION

Contamination of augmentor fuel control will make it unserviceable.

a. Place augmentor fuel control on a clean work bench. Position control so segment sequencing electro-hydraulic servo-valve (EHV) can be easily removed. If control is mounted on engine, disconnect electrical connector P98.

b. Clean area around EHV with a clean cloth moistened with P-D-680, Type II petroleum solvent. Blow area dry with clean compressed air at less than 30 psig.

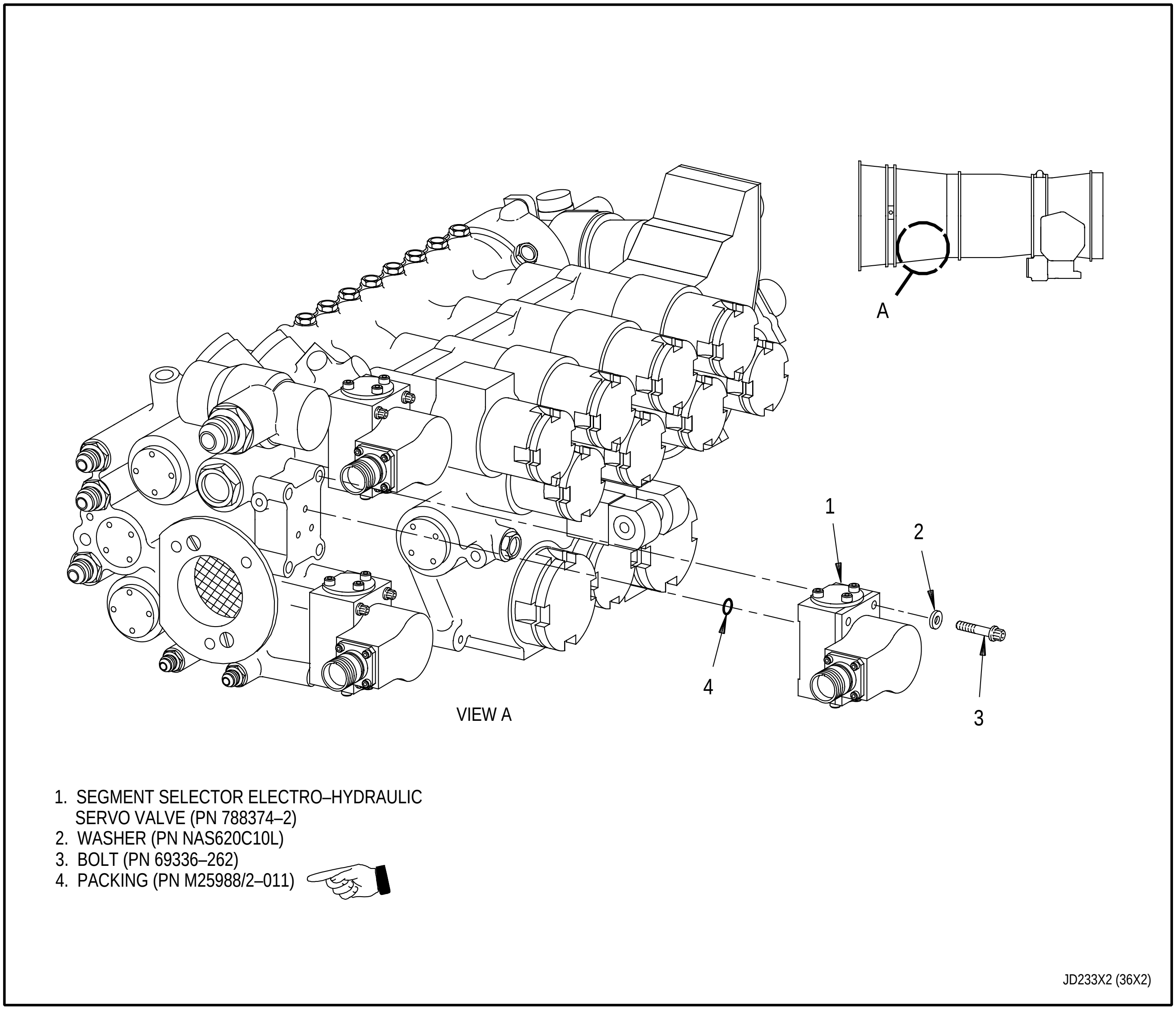


Figure 11. Segment Sequencing Electro-Hydraulic Servo-Valve - Replacement

c. Place a container under control to catch any fuel as the EHV is being removed.

d. Remove bolts(3, figure 11) and washers(2). Remove EHV(1). Remove and discard packings(4).

e. Remove protective closures from replacement EHV. Retain closures for use on EHV removed from control.

f. Lubricate packings(4) with a light coat of VV-P-236 petrolatum. Install on EHV.

g. Install EHV on control aligning pin in EHV with locating hole in control.

h. Apply a light coat of PWA 550 antigalling compound to bolts(3). Remove excess.

NOTE

Apply light pressure by hand to EHV(1) while installing washers(2) and bolts, until final torque.

i. Install bolts(3) and washers(2) fingertight.

j. Run-in torque required to install bolts(3) into control shall be 2 to 13 pound-inches. Replace bolt if torque is not 2 to 13 pound-inches. If torque still cannot be met, replace control.

k. Final torque bolts 30 to 35 pound-inches in a criss-cross pattern.

l. If control is mounted on engine, connect electrical cable connector P98 to mating receptacle on core metering valve as follows:

   (1) Align keyways and handtighten connector.

   (2) Ensure red line on receptacle is not visible when viewed at right angles.

   (3) Tighten connector firmly with soft-jawed pliers.

m. If control is mounted on engine, perform leak check. Refer to T.O. 2J-F100-11-2, WP 302 00.

n. Preserve unserviceable EHV by completely filling it with MIL-L-6081, Grade 1005 or 1010, 10 micron filtered oil. Do not immerse or oil flush electrical connector. Drain excess oil from EHV.

o. Install protective closures from replacement EHV on unserviceable EHV and pack in shipping container.

10. DUCT METERING VALVE ELECTRO-HYDRAULIC SERVO-VALVE (EHV) - REPLACEMENT.
(See Figure 12.)

CAUTION

Contamination of the augmentor fuel control will make it unserviceable.

a. Place augmentor fuel control on a clean work bench. Position control so duct metering valve EHV can be easily removed. If control is mounted on engine, disconnect electrical connector P102.

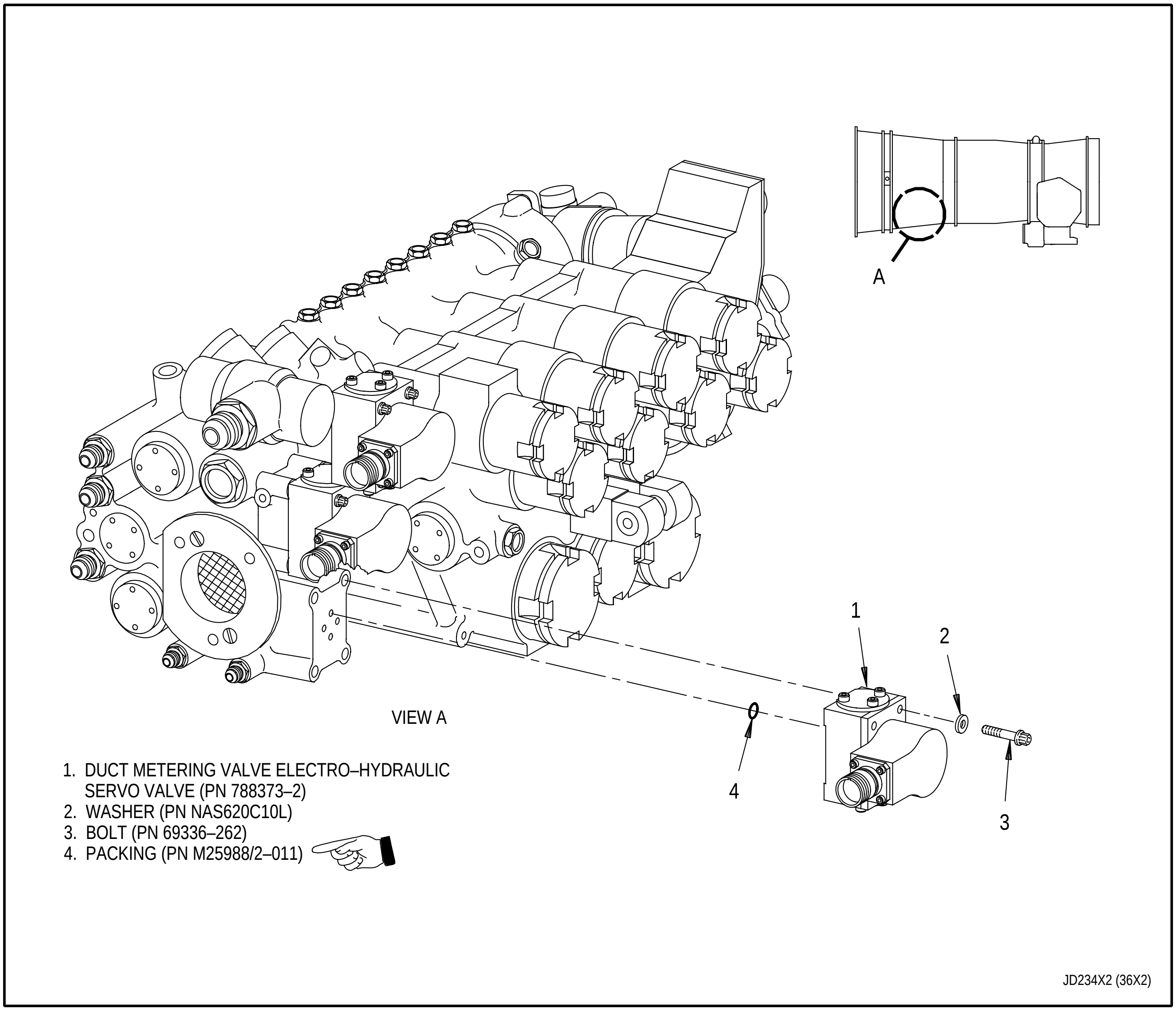


Figure 12. Duct Metering Valve Electro-Hydraulic Servo-Valve - Replacement

b. Clean area around EHV with a clean cloth moistened with P-D-680, Type II petroleum solvent. Blow area dry with clean compressed air at less than 30 psig.

c. Place a container under control to catch any fuel as EHV is being removed.

d. Remove bolts(3) and washers(2). Remove EHV(1). Remove and discard packings(4).

e. Remove protective closures from replacement EHV. Hold closures for later use on EHV removed from control.

f. Lubricate packings(4) with a light coat of VV-P-236 petrolatum. Install on EHV.

g. Install EHV on control aligning pin in EHV with locating hole in control.

h. Apply a light coat of PWA 550 antigalling compound to bolts(3). Remove excess.

NOTE

Apply light pressure by hand to EHV(1) while installing washers(2) and bolts(3), until final torque.

i. Install washers(2) and bolts(3) fingertight.

j. Run-in torque required to install bolts(3) into control shall be 2 to 13 pound-inches. Replace bolt if torque is not 2 to 13 pound-inches. If torque still cannot be met, replace control.

k. Final torque bolt 30 to 35 pound-inches in a criss-cross pattern.

l. If control is mounted on engine, connect electrical connector P102 to mating receptacle on EHV as follows:

(1) Align keyways and handtighten connector.

(2) Ensure red line on receptacle is not visible when viewed at right angles.

(3) Tighten connector firmly with soft-jawed pliers.

m. If control is mounted on engine, perform leak check. Refer to T.O. 2J-F100-11-2, WP 302 00.

n. Preserve unserviceable EHV by completely filling it with MIL-L-6081, Grade 1005 or 1010, 10 micron filtered oil. Do not immerse or oil flush electrical connector. Drain excess oil from EHV.

o. Install protective closures from replacement kit on unserviceable EHV and pack it in shipping container.

11. CORE METERING VALVE ELECTRO-HYDRAULIC SERVO-VALVE (EHV) - REPLACEMENT.
(See Figure 13.)

CAUTION

Contamination of augmentor fuel control will make it unserviceable.

a. Place augmentor fuel control on a clean work bench. Position control so core metering valve electro-hydraulic servo-valve (EHV) can be easily removed. If control is mounted on engine, disconnect electrical connector P100.

b. Clean area around EHV with a clean cloth moistened with P-D-680, Type II petroleum solvent. Blow area dry with clean compressed air at less than 30 psig.

c. Place a container under control to catch any fuel as EHV is being removed.

d. Remove bolts(3, figure 13) and washers(2). Remove EHV(1). Remove and discard packings(4).

e. Remove protective closures from replacement EHV. Hold protective closures for later use on EHV removed from control.

f. Lubricate packings(4) with a light coat VV-P-236 petrolatum. Install on EHV.

g. Install EHV on control aligning pin in EHV with locating hole in control.

h. Apply a light coat of PWA 550 antigalling compound to bolts(3). Remove excess.

NOTE

Apply light pressure by hand to EHV(1) while installing washers(2) and bolts(3), until final torque.

i. Install washers(2) and bolts(3) fingertight.

j. Run-in torque required to install bolts(3) into control shall be 2 to 13 pound-inches. Replace bolt if torque is not 2 to 13 pound-inches. If torque still cannot be met, replace control.

k. Final torque bolts(3) 30 to 35 pound-inches in a criss-cross pattern.

l. If control is mounted on engine, connect electrical cable connector P100 to mating receptacle on core metering valve as follows:

(1) Align keyways and handtighten connector.

(2) Ensure red line on receptacle is not visible when viewed at right angles.

(3) Tighten connector firmly with soft-jawed pliers.

m. If control is mounted on engine, perform leak check. Refer to T.O. 2J-F100-11-2, WP 302 00.

n. Preserve unserviceable EHV by completely filling it with MIL-L-6081, Grade 1005 or 1010, 10 micron filtered oil. Do not immerse or oil flush electrical connector. Drain excess oil from EHV.

o. Install protective closures from replacement EHV on unserviceable EHV. Pack it in shipping container.

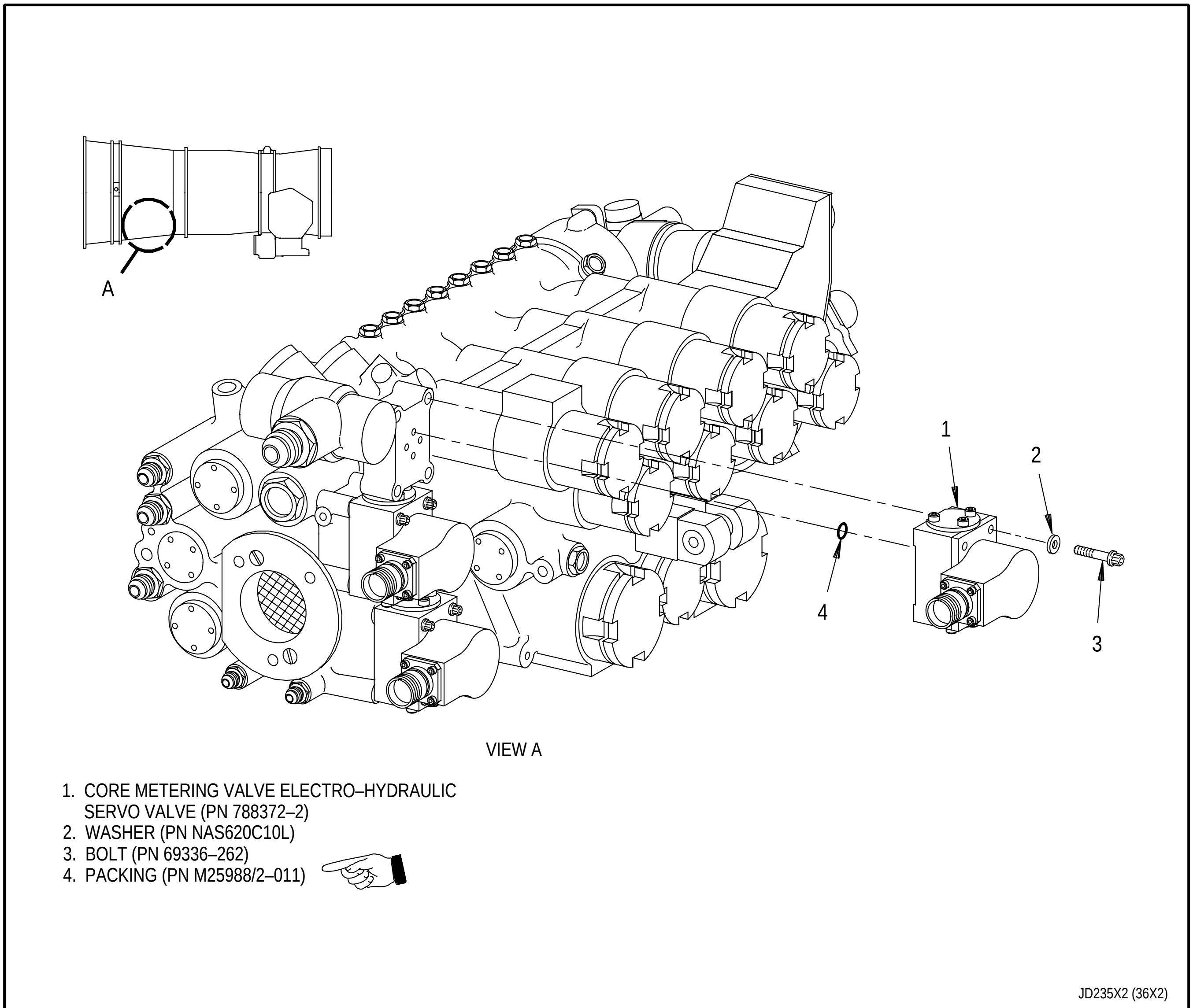


Figure 13. Core Metering Valve Electro-Hydraulic Servo-Valve - Replacement

12. SEGMENT SELECT RESOLVER ASSEMBLY - REPLACEMENT.

(See Figure 14.)

CAUTION

Contamination of augmentor fuel control will make it unserviceable.

a. If control is mounted on engine, disconnect electrical connector P99 from core metering valve resolver. If augmentor fuel control is removed from engine, proceed to step c.

b. Place augmentor fuel control on a clean work bench. Position control so core metering valve resolver and cover assembly can be easily removed.

c. Clean area around the resolver assembly with a clean cloth moistened with P-D-680, Type II petroleum solvent. Blow area dry with clean compressed air at less than 30 psig.

d. Place a container under control to catch any spilled fuel as resolver assembly is being removed.

e. Remove bolts(1, figure 14) and washers(2).

f. Remove resolver assembly(3) from control body.

NOTE

Do not remove packing, unless damaged.

g. Using a mirror, inspect packing(4) in groove of control for tears and wear. If necessary, carefully remove damaged packing.

h. If replacement packing(4) is required, lubricate with a light coat of VV-P-236 petrolatum and position in groove of control. Ensure packing is firmly seated.

i. Remove protective closures from replacement resolver. Hold protective closures for later use on resolver removed from control.

j. Install resolver assembly(3) into control, ensuring resolver is seated flush with control mating surface.

k. Apply a light coat of PWA 550 antigalling compound to bolts(1). Remove excess.

l. Install bolts(1) and washers(2) fingertight.

m. Run-in torque required to install bolts(1) into control shall be 2 to 13 pound-inches. Replace bolt if torque is not 2 to 13 pound-inches. If torque still cannot be met, replace control.

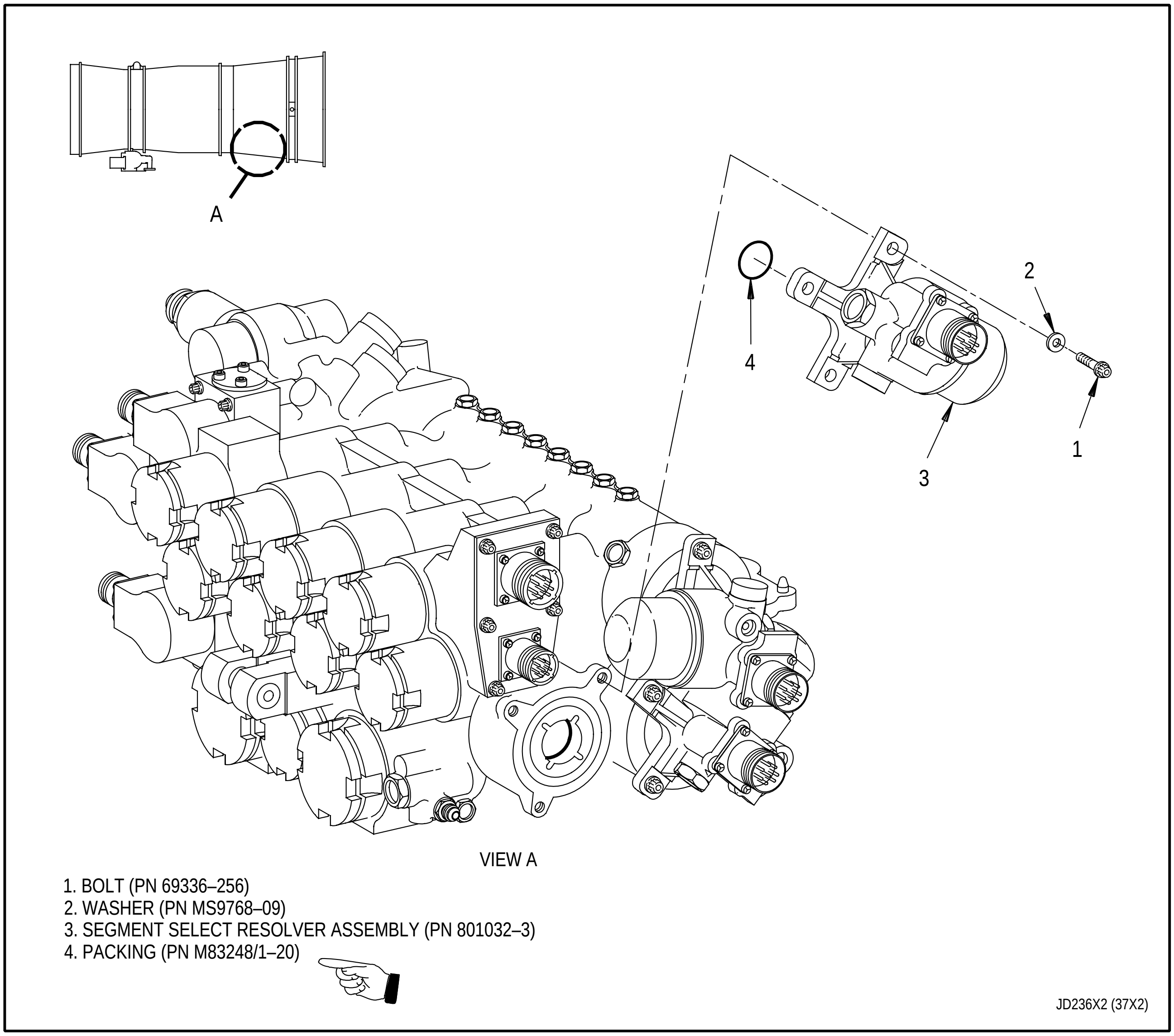


Figure 14. Segment Select Resolver Assembly - Replacement

n. Final torque bolts(1) 15 to 20 pound-inches.

o. If control is mounted on engine, connect electrical cable connector P99 to mating receptacle on sequence valve resolver, as follows:

   (1) Align keyways and handtighten connector.

   (2) Ensure red line on receptacle is not visible when viewed at right angles.

   (3) Tighten connector firmly with soft-jawed pliers.

p. If control is mounted on engine, perform leak check. Refer to T.O. 2J-F100-11-2, WP 206 00.

q. Preserve unserviceable resolver by completely filling it with MIL-L-6081, Grade 1005 or 1010, 10 micron filtered oil. Do not immerse or oil flush electrical connector. Drain excess oil from resolver.

r. Install protective closures from replacement resolver on unserviceable resolver and pack in shipping container.

13. DUCT METERING VALVE RESOLVER ASSEMBLY - REPLACEMENT.

(See Figure 15.)

CAUTION

Contamination of augmentor fuel control will make it unserviceable.

a. If control is mounted on engine, disconnect electrical connector P103 from duct metering valve resolver. If augmentor fuel control is removed from engine, proceed to step c.

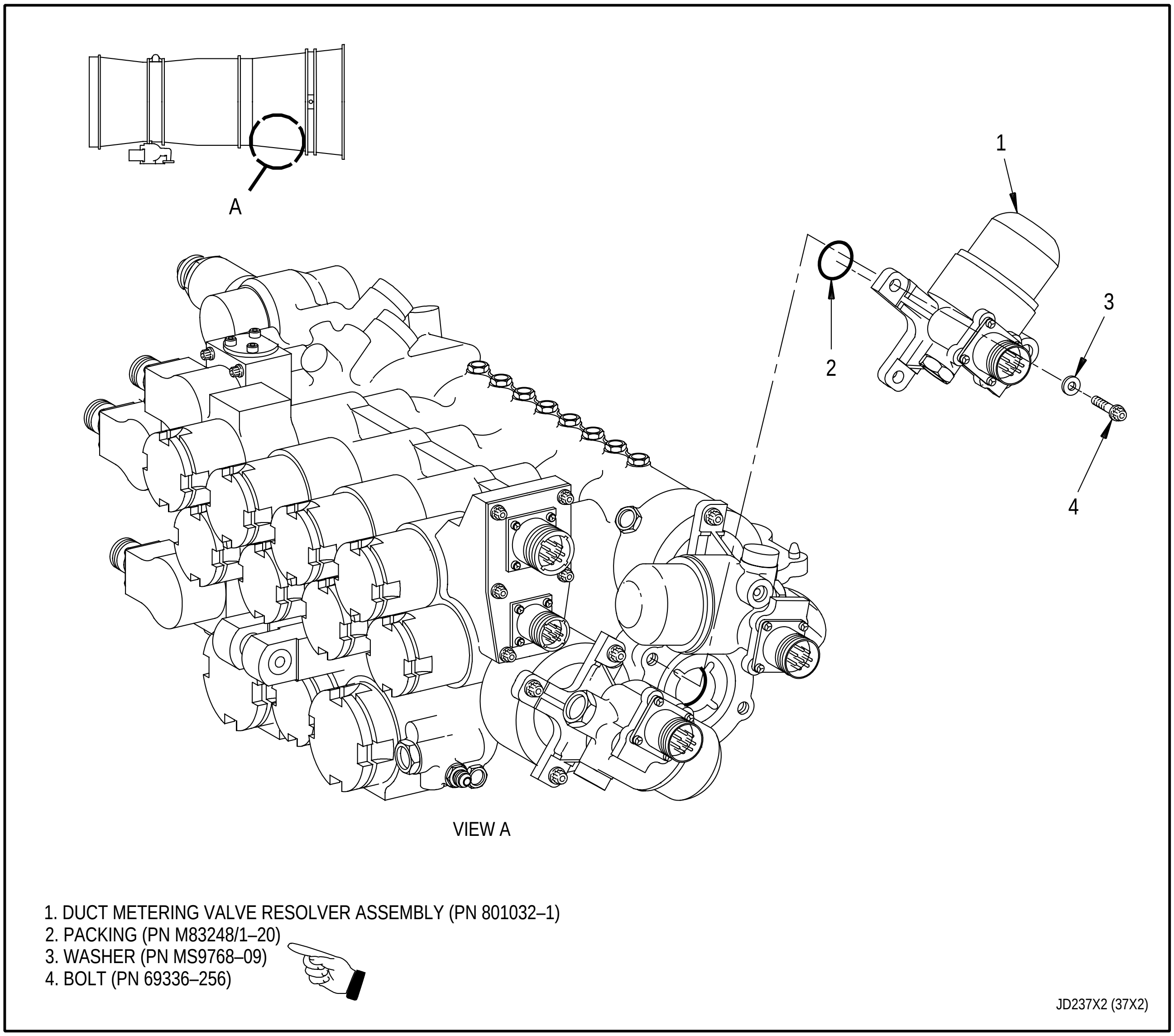


Figure 15. Duct Metering Valve Resolver Assembly - Replacement

b. Place augmentor fuel control on a clean work bench. Position control so duct metering valve resolver and cover assembly can be easily removed.

c. Clean area around resolver assembly with a clean cloth moistened with P-D-680, Type II petroleum solvent. Blow area dry with clean compressed air at less than 30 psig.

d. Place a container under control to catch any spilled fuel as resolver assembly is being removed.

e. Remove bolts(4, figure 15) and washers(3).

f. Remove duct metering valve resolver(1) from control.

NOTE

Do not remove packing, unless damaged.

g. Using a mirror, inspect packing(2) in groove of control for tears and wear. If necessary, carefully remove damaged packing.

h. If replacement packing(2) is required, lubricate with a light coat of VV-P-236 petrolatum and position in groove of control. Ensure packing is firmly seated.

i. Remove protective closures from replacement resolver. Hold protective closures for later use on resolver removed from control.

j. Install resolver assembly(1) into control, ensuring resolver is seated flush with control mating surface.

k. Apply a light coat of PWA 550 antigalling compound to bolts(4). Remove excess.

l. Install bolts(4) and washers(3) fingertight.

m. Run-in torque required to install bolts(4) into control shall be 2 to 13 pound-inches. Replace bolt if torque is not 2 to 13 pound-inches. If torque still cannot be met, replace control.

n. Final torque bolts(4) 15 to 20 pound-inches.

o. If control is mounted on engine, connect electrical cable connector P103 to mating receptacle on duct metering valve resolver, as follows:

   (1) Align keyways and handtighten connector.

   (2) Ensure red line on receptacle is not visible when viewed at right angles.

   (3) Tighten connector firmly with soft-jawed pliers.

p. If control is mounted on engine, perform leak check. Refer to T.O. 2J-F100-11-2, WP 206 00.

q. Preserve unserviceable resolver by completely filling it with MIL-L-6081, Grade 1005 or 1010, 10 micron filtered oil. Do not immerse or oil flush electrical connector. Drain excess oil from resolver.

r. Install protective closures from replacement resolver on unserviceable resolver and pack it in shipping container.

14. CORE METERING VALVE RESOLVER ASSEMBLY - REPLACEMENT.

(See Figure 16.)

CAUTION

Contamination of augmentor fuel control will make it unserviceable.

a. If control is mounted on engine, disconnect electrical connector P101 from core metering valve resolver. If augmentor fuel control is removed from engine, proceed to step c.

b. Place augmentor fuel control on a clean work bench. Position control so core metering valve resolver and cover assembly can be easily removed.

c. Clean area around resolver with a clean cloth moistened with P-D-680, Type II petroleum solvent. Blow area dry with clean compressed air at less than 30 psig.

d. Place a container under control to catch any spilled fuel as resolver assembly is being removed.

e. Remove bolts(1, figure 16) and washers(2).

f. Remove resolver assembly(3) from control.

NOTE

Do not remove packing, unless damaged.

g. Using a mirror, inspect packing(4) in groove of control for tears and wear. If necessary, carefully remove damaged packing.

h. If replacement packing(4) is required, lubricate with a light coat of VV-P-236 petrolatum and position in groove of control. Ensure packing is firmly seated.

i. Remove protective closures from replacement resolver. Hold protective closures for later use on resolver removed from control.

j. Install resolver assembly(3) into control, ensuring resolver is seated flush with control mating surface.

k. Apply a light coat of PWA 550 antigalling compound to bolts(4). Remove excess.

l. Install bolts(1) and washers(2) fingertight.

m. Run-in torque required to install bolts(1) into control shall be 2 to 13 pound-inches. Replace bolt if torque is not 2 to 13 pound-inches. If torque still cannot be met, replace control.

n. Final torque bolts(1) 15 to 20 pound-inches.

o. If control is mounted on engine, connect electrical cable connector P101 to mating receptacle on core metering valve resolver, as follows:

(1) Align keyways and handtighten connector.

(2) Ensure red line on receptacle is not visible when viewed at right angles.

(3) Tighten connector firmly with soft-jawed pliers.

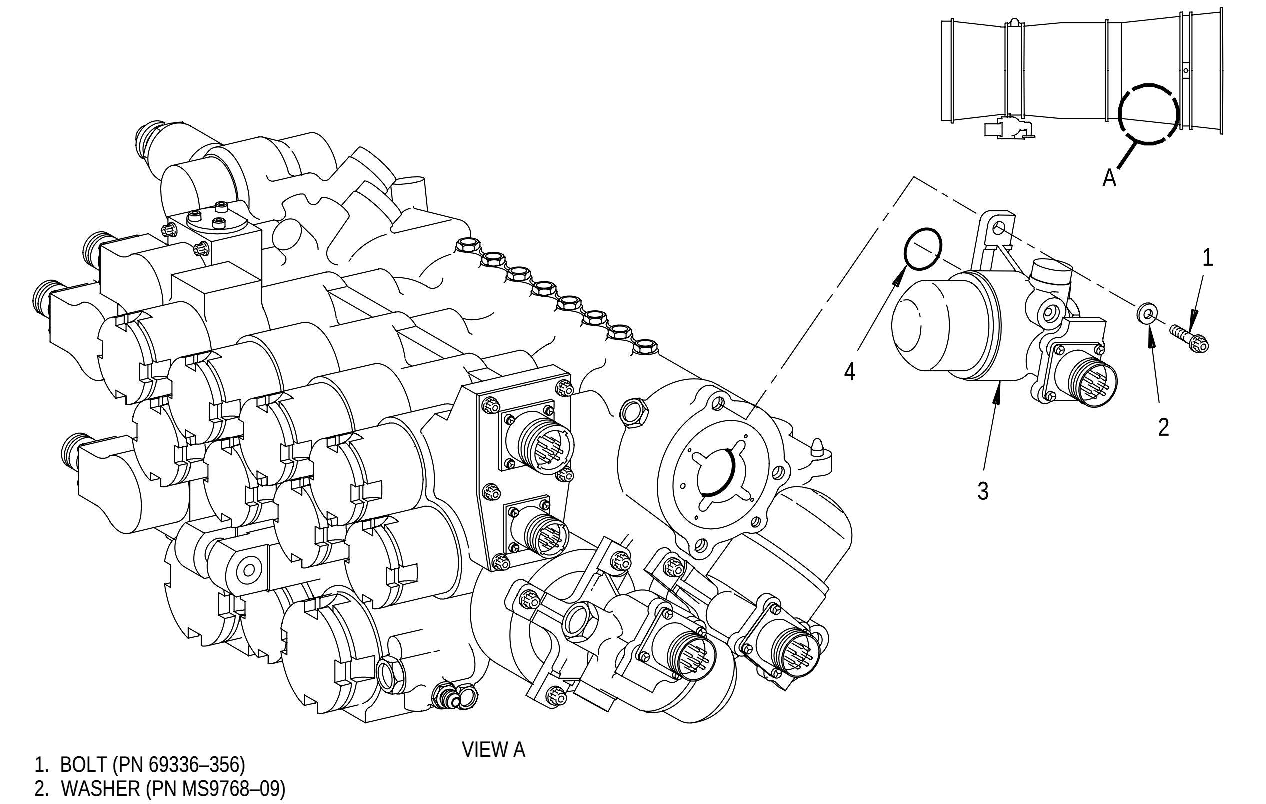


Figure 16. Core Metering Valve Resolver Assembly - Replacement

p. If control is mounted on engine, perform leak check. Refer to T.O. 2J-F100-11-2, WP 206 00.

q. Preserve unserviceable resolver by completely filling it with MIL-L-6081, Grade 1005 or 1010, 10 micron filtered oil. Do not immerse or oil flush electrical connector. Drain excess oil from resolver.

r. Install protective closures from replacement resolver on unserviceable resolver and pack in shipping container.

15. AUGMENTOR FUEL CONTROL - LEAK CHECK.

(See Figure 17.)

a. Cap the following ports: (See figure 17.)

(1) PF3AR

(2) PFAP

(3) PFPC

(4) PF1AW

b. Open the following ports: (See figure 17.)

(1) PFMO

(2) PF1

(3) PF1SM

(4) PF1ACI (three bolt flange)

c. Lubricate threads of adapters with MIL-L-7808 oil.

d. Position PN GS22039-1 inlet adapter on PF1ACI port.

e. Secure adapter with bolts, and torque 40 to 60 pound-inches.

f. Install standard AN5/AN6 reducing adapter onto PF1SM port. Torque adapter 60 to 80 pound-inches.

g. Connect extend hose from PWA 50096 cart containing JP-4 fuel or MIL-C-7024 Type II calibrating fluid to adapters on PF1ACI and PF1SM ports using a standard tee fitting and pressurization hose.

h. Pressurize PF1ACI and PF1SM port 10 to 15 psig or until fluid flows from PF1 port.

i. Reduce pressure on PF1ACI and PF1SM to 0 psig and cap PF1 port.

j. Pressurize PF1ACI and PF1SM 40 to 60 psig.

k. Check control for leakage after 5 minutes.

(1) If fuel control outlet manifold leakage exceeds 2.5cc per minute per segment, or if total leakage exceeds 5cc per minute, replace control.

(2) If PFMO port leakage exceeds 6cc per minute replace control.

NOTE

Leakage is not allowed between modules and control mating surfaces.

(3) If replacement assemblies are leaking, shut down cart. Repair or replace control as necessary.

(4) If leakage does not occur, reduce pressure to 0.

l. Remove hose from PF1SM inlet adapter.

m. Slowly remove PF1SM port cap. Allow residual pressure to bleed from control.

n. Remove remainder fuel supply lines, and cap fuel ports.

o. Remove plug and drain residual fluid by shaking control.

p. Install protective closures on open ports.

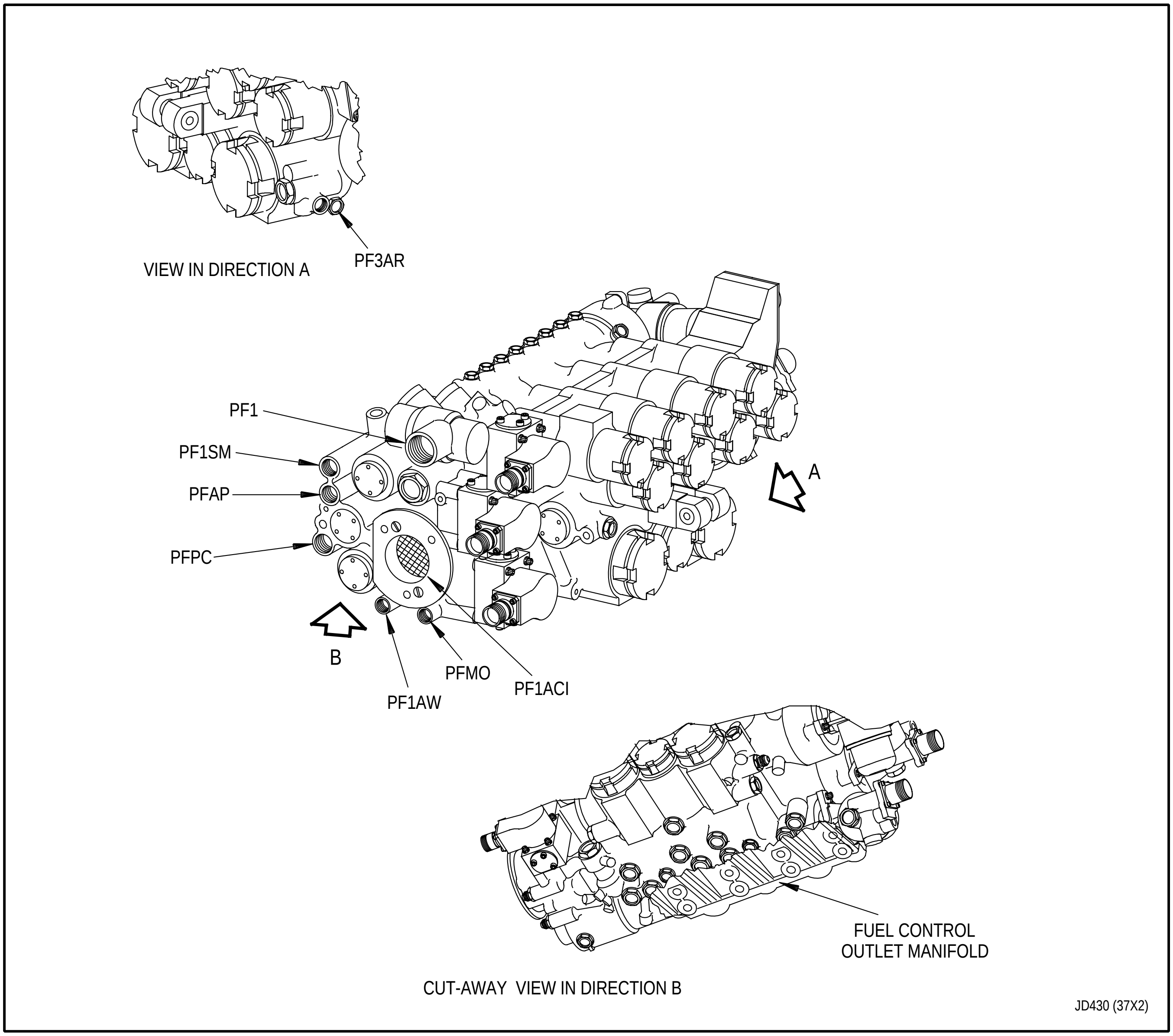


Figure 17. Augmentor Fuel Control - Leak Check

16. AUGMENTOR FUEL CONTROL - STORAGE AND SHIPMENT.
(See figure 4.)

NOTE

Preservation is required when a unit is to be stored for more than 30 days.

a. Remove all attaching parts. (See figure 4.)

b. Fill all fuel ports with MIL-L-6081, Grade 1010 oil. Drain excess oil from unit. Cap all ports with protective closures.

c. Install shipping caps.

d. Install protective closure and secure with screws.

e. Wipe external surfaces with a clean, dry, lint-free cloth.

f. Wrap in barrier material, MIL-B-121, Type II, Grade A, Class I or equivalent.

g. If control will be shipped, pack in a shipping container. Use original shipping container, if possible. Cushion control with shock absorbent material.

WORK PACKAGE

TECHNICAL PROCEDURES

VALVE - FUEL PRESSURIZING AND DUMP

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 12

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 12	0				

REFERENCE MATERIAL REQUIRED

None

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Cloth, dry lint-free	-
Compound, antigalling, (PWA 550)	Hi-T-650 or Lubri-Bond HT
Lockwire (0.032 inch diameter)	MS9226-04
Oil, lubricating	MIL-L-7808
or	
Petrolatum	VV-P-236
(alternate to oil)	
Oil, preservation	MIL-L-6081
Solvent, petroleum	P-D-680, Type II

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Packing, preformed	MS9966-04	1
Packing, preformed	MS9966-08	1
Packing, preformed	MS9966-10	3

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures on the fuel pressurizing and dump valve:

- Removal
- Removal of attaching parts
- Cleaning
- Inspection
- Installation of attaching parts
- Installation
- Storage and shipment

2. FUEL PRESSURIZING AND DUMP VALVE - REMOVAL.
(See Figure 1.)

a. Disconnect tube from fuel pressurizing and dump valve. (See figure 1, Sheet 1.)

b. Remove bolts securing fuel manifold supply tube to valve. Remove and discard packing.

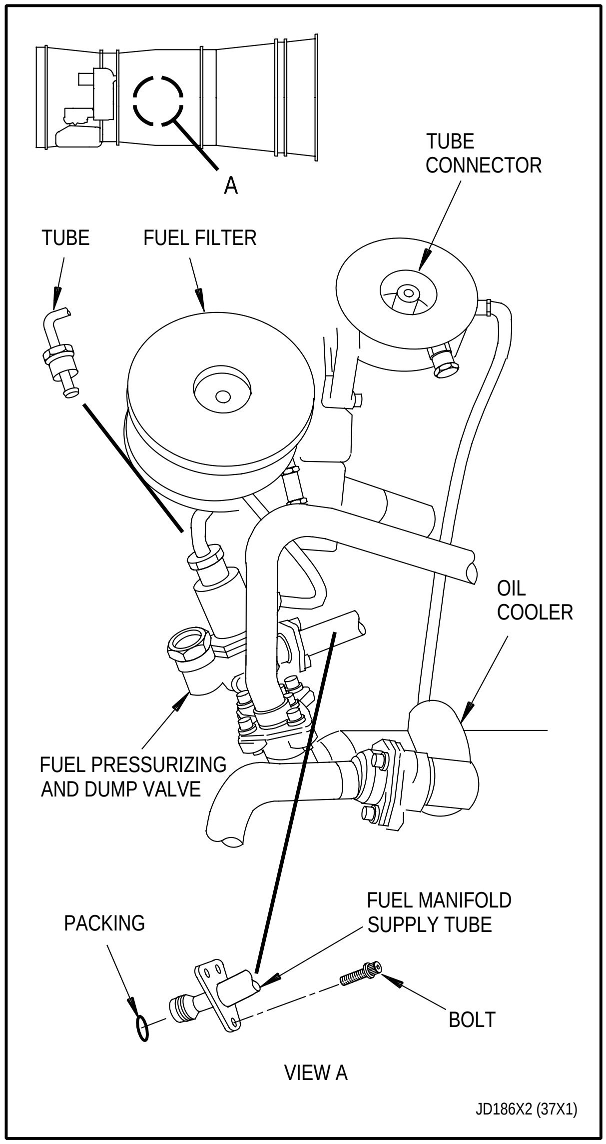


Figure 1. Fuel Pressurizing and Dump Valve - Removal (Sheet 1 of 2)

c. Remove nuts securing valve to oil cooler. (See figure 1, Sheet 2.)

d. Slowly lift valve off oil cooler to assure any residual fuel pressure is relieved.

e. Remove transfer tube. Remove and discard packings.

f. Install protective closures.

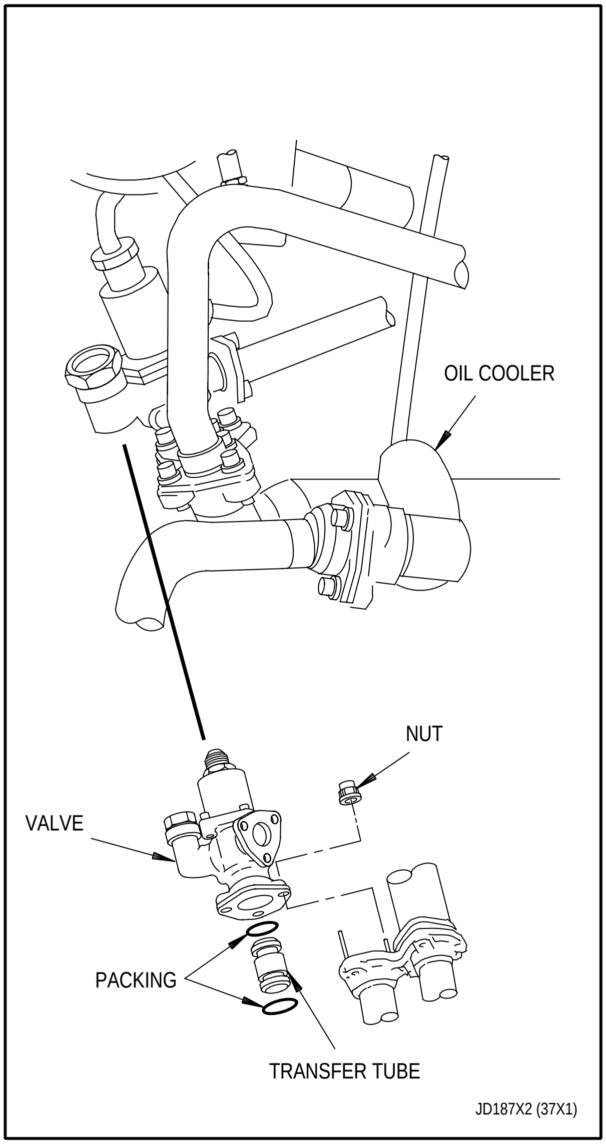


Figure 1. Fuel Pressurizing and Dump Valve - Removal (Sheet 2 of 2)

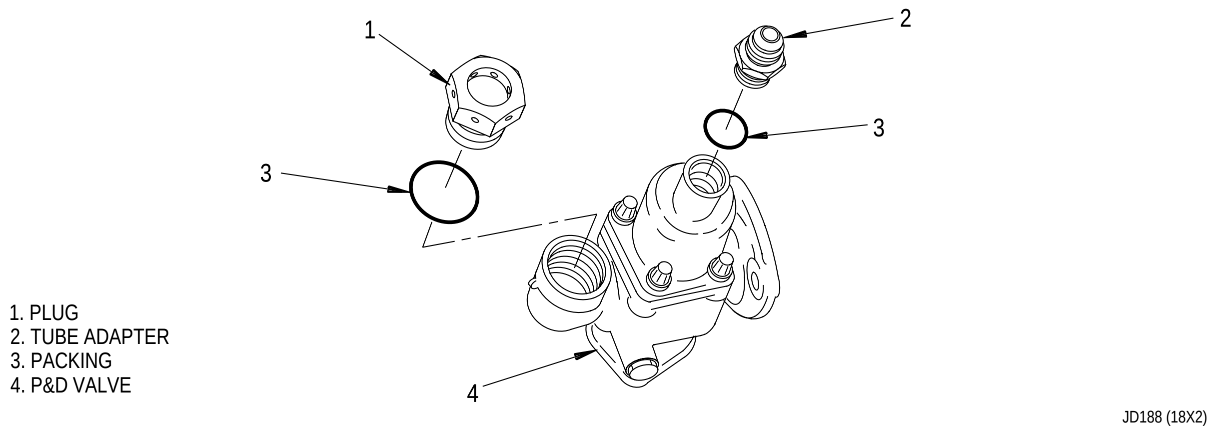


Figure 2. Fuel Pressurizing and Dump Valve - Removal of Attached Parts

3. FUEL PRESSURIZING AND DUMP VALVE - REMOVAL OF ATTACHING PARTS.

(See Figure 2.)

a. Remove plug(1) and tube adapter(2, figure 2) from top of fuel pressurizing and dump valve(4); remove and discard packings(3).

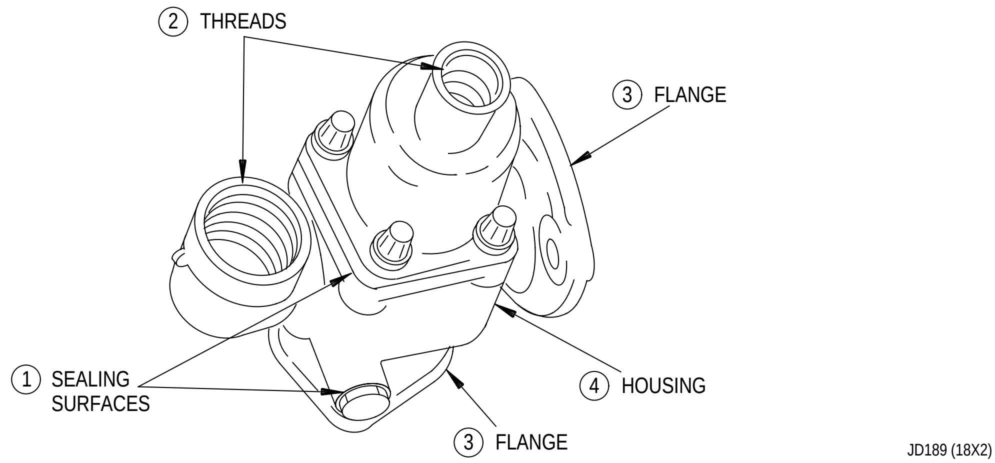
4. FUEL PRESSURIZING AND DUMP VALVE - CLEANING.

a. Wipe exterior of fuel pressurizing and dump valve with clean cloth moistened with P-D-680, Type II petroleum solvent.

b. Dry with clean, dry lint-free cloth.

5. FUEL PRESSURIZING AND DUMP VALVE - INSPECTION.
(See Figure 3.)

a. Visually inspect fuel pressurizing and dump valve. (See figure 3.)



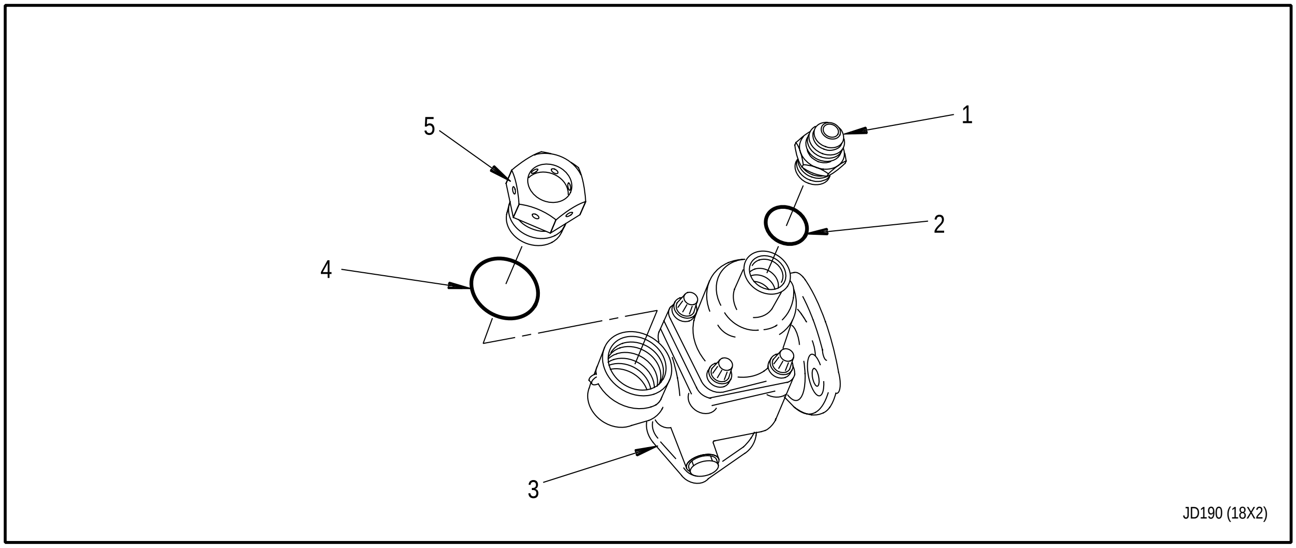
Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Sealing surfaces -			
Evidence of leakage	Not serviceable	Not reparable	Replace valve.
2. Threads -			
Crossed or damaged	Not serviceable	Not reparable	Replace valve.
3. Flange -			
Cracked	Not serviceable	Not reparable	Replace valve.
Nicks or scratches	Not serviceable if nicks or scratches have raised edges	Small nicks and scratches with raised edges	Blend raised edges flush with face of flange. Replace valve if scratch extends radially across face of flange.
4. Housing -			
Cracks	Not serviceable	Not reparable	Replace valve.

Figure 3. Fuel Pressurizing and Dump Valve - Inspection

6. FUEL PRESSURIZING AND DUMP VALVE - INSTALLATION OF ATTACHING PARTS.
(See Figure 4.)

a. Lubricate packings with MIL-L-7808 oil or VV-P-236 petrolatum.

b. Install packing(2 and 4, figure 4) on tube adapter(1) and plug(5). Install and torque adapter and plug. (See figure 4.)



Index Number	Description	Lubrication	Torque (lb-in.)	Lockwire
1.	PN 4061267 tube adapter	Oil	65 to 75	-
2.	PN MS9966-04 packing	Oil	-	-
3.	Fuel pressurizing and dump valve	-	-	-
4.	PN MS9966-08 packing	Oil	-	-
5.	PN MS9902-08 plug	Oil	200 to 225	MS 9226-04

Figure 4. Fuel Pressurizing and Dump Valve - Installation of Attaching Parts

7. FUEL PRESSURIZING AND DUMP VALVE - INSTALLATION.
(See Figure 5.)

a. Coat packings with MIL-L-7808 oil or VV-P-236 petrolatum. (See figure 5.)

b. Install packings on transfer tube and install tube in fuel pressurizing and dump valve. (See figure 5, Sheet 1.)

c. Install valve on oil cooler pad.

d. Coat threads of studs with PWA 550 antigalling compound. Secure valve to oil cooler with nuts. Torque nuts 54 to 60 pound-inches.

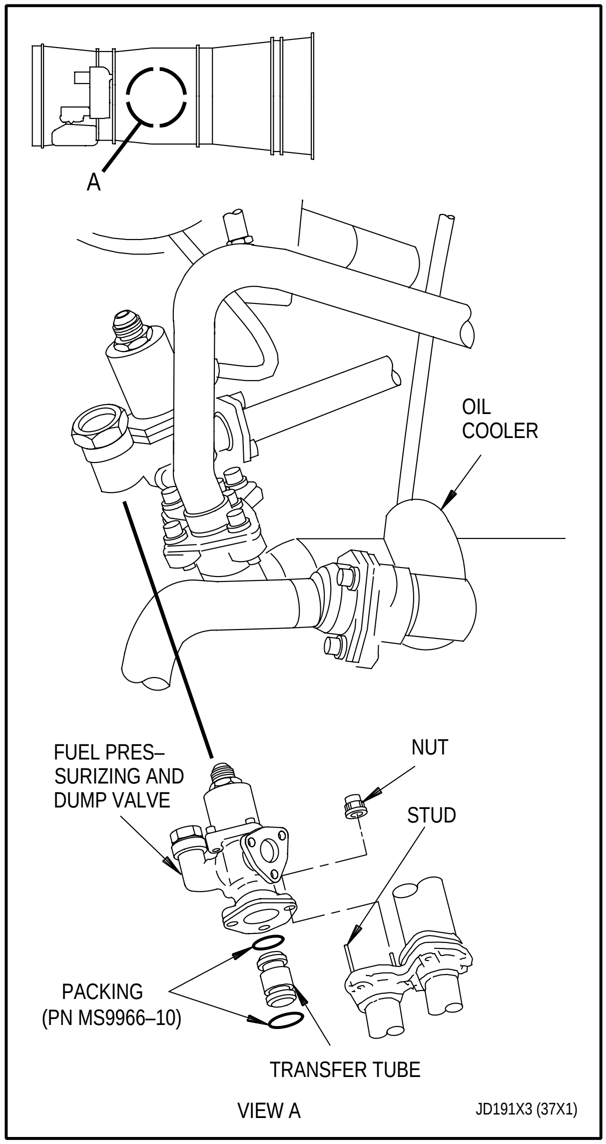


Figure 5. Fuel Pressurizing and Dump Valve - Installation (Sheet 1 of 2)

e. Coat threads of bolts with PWA 550 antigalling compound.

f. Coat packing with MIL-L-7808 oil or VV-P-236 petrolatum and install packing on tube. (See figure 5, Sheet 2.)

g. Position fuel manifold supply tube on valve and install bolts. Torque bolts 54 to 60 pound-inches.

h. Apply PWA 550 antigalling compound to threads of tube nuts.

i. Connect tube to valve.

j. Torque tube nut 65 to 75 pound-inches.

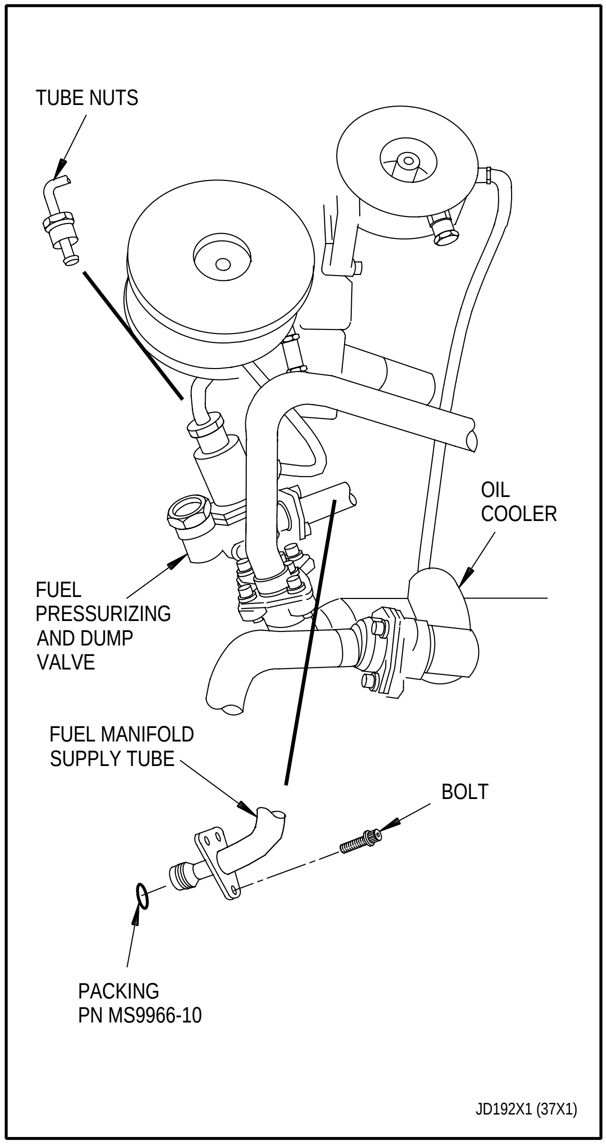


Figure 5. Fuel Pressurizing and Dump Valve - Installation (Sheet 2 of 2)

8. FUEL PRESSURIZING AND DUMP VALVE - STORAGE AND SHIPMENT.

a. Allow all residual fuel or oil to drain from fittings and ports.

b. Remove all attaching hardware which is not considered part of valve. Refer to paragraph 3.

NOTE

Preservation is required if valve is to be stored for more than 30 days.

c. Preserve valve by filling fuel ports with MIL-L-6081 engine oil. Drain excess.

d. Cap all open ports and fittings securely with protective closures.

CAUTION

Do not water wash or dip accessory in solvent as this procedure can cause severe internal corrosion damage.

e. If exterior of unit requires cleaning, wipe with clean cloth moistened with P-D-680, Type II petroleum solvent and dry with clean, dry, lint-free cloth.

f. Pack valve in shipping container, ensuring unit is securely mounted on mounting pad provided. If no mounting provisions are available, ensure unit is thoroughly cushioned with shock absorbent packing material.

WORK PACKAGE

TECHNICAL PROCEDURES

CONTROLLER - FUEL PUMP, AUGMENTOR

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 12

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 11	0				
12 Blank	0				

REFERENCE MATERIAL REQUIRED

None

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Cloth, dry, lint-free	-
Compound, antigalling, (PWA 550)	Hi-T-650 or Lubri-Bond HT
Oil, lubricating	MIL-L-7808
Oil, lubricating	MIL-L-6081, Grade 1010
Petrolatum	VV-P-236
Solvent, petroleum	P-D-680, Type II
Tape, moisture proof	-
Wrapping, moisture and vapor proof	-

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Packing, preformed	MS9966-04	2
Packing, preformed	MS9966-05	2
Packing, preformed	MS9966-06	1
Ring, Seal	4069472	2

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures on the augmentor fuel pump controller:

- Removal
- Removal of attaching parts
- Cleaning
- Inspection
- Installation of attaching parts
- Installation
- Storage and shipment
- Follow-on maintenance

2. CONTROLLER, AUGMENTOR FUEL PUMP - REMOVAL.

(See Figure 1.)

a. Disconnect tubes from augmentor fuel pump controller. (See figure 1, Sheet 1.)

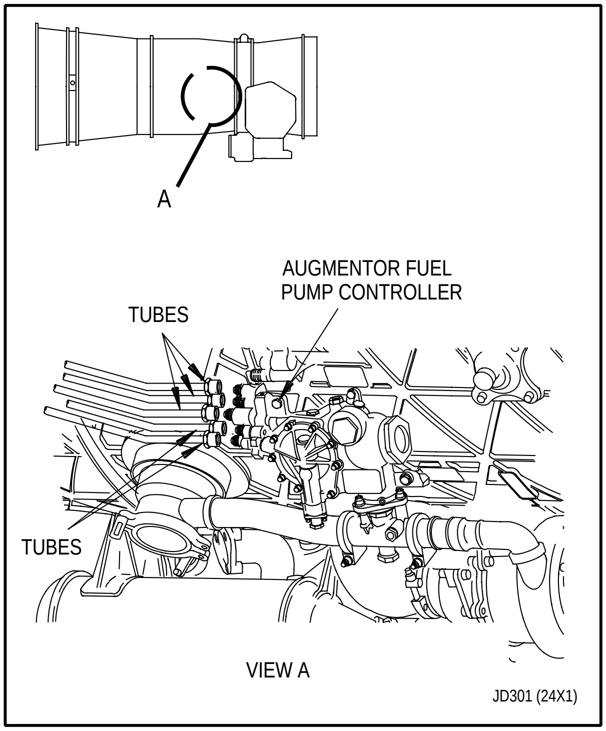


Figure 1. Augmentor Fuel Pump Controller - Removal (Sheet 1 of 3)

b. Loosen nuts and remove coupling clamps. (See figure 1, Sheet 2.)

c. Remove augmentor fuel pump air supply manifold from controller by sliding collars away from air valve assembly. If collar does not slide, soak collar in penetrating oil.

d. Discard seal ring.

e. Disengage augmentor pump seal tube from controller by sliding collar away from air valve assembly. If collar does not slide, go to step g. and soak collar in penetrating oil for ease of reassembly.

f. Discard seal ring.

g. Remove bolts and washers securing controller to engine. Remove controller. (See figure 1, sheet 3.)

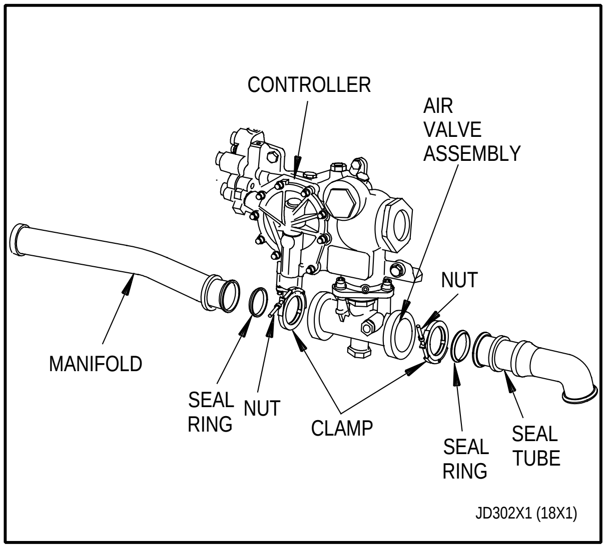


Figure 1. Augmentor Fuel Pump Controller - Removal (Sheet 2 of 3)

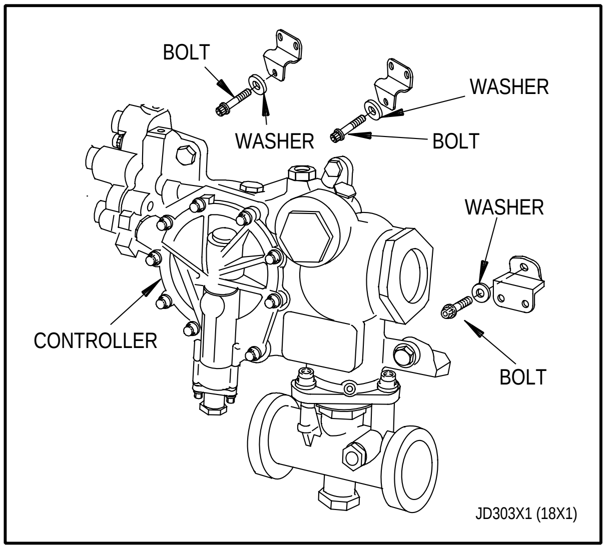


Figure 1. Augmentor Fuel Pump Controller - Remove (Sheet 3 of 3)

3. CONTROLLER, AUGMENTOR FUEL PUMP - REMOVAL OF ATTACHING PARTS.
(See Figure 2.)

a. Remove adapters from controller and discard packings. (See figure 2.)

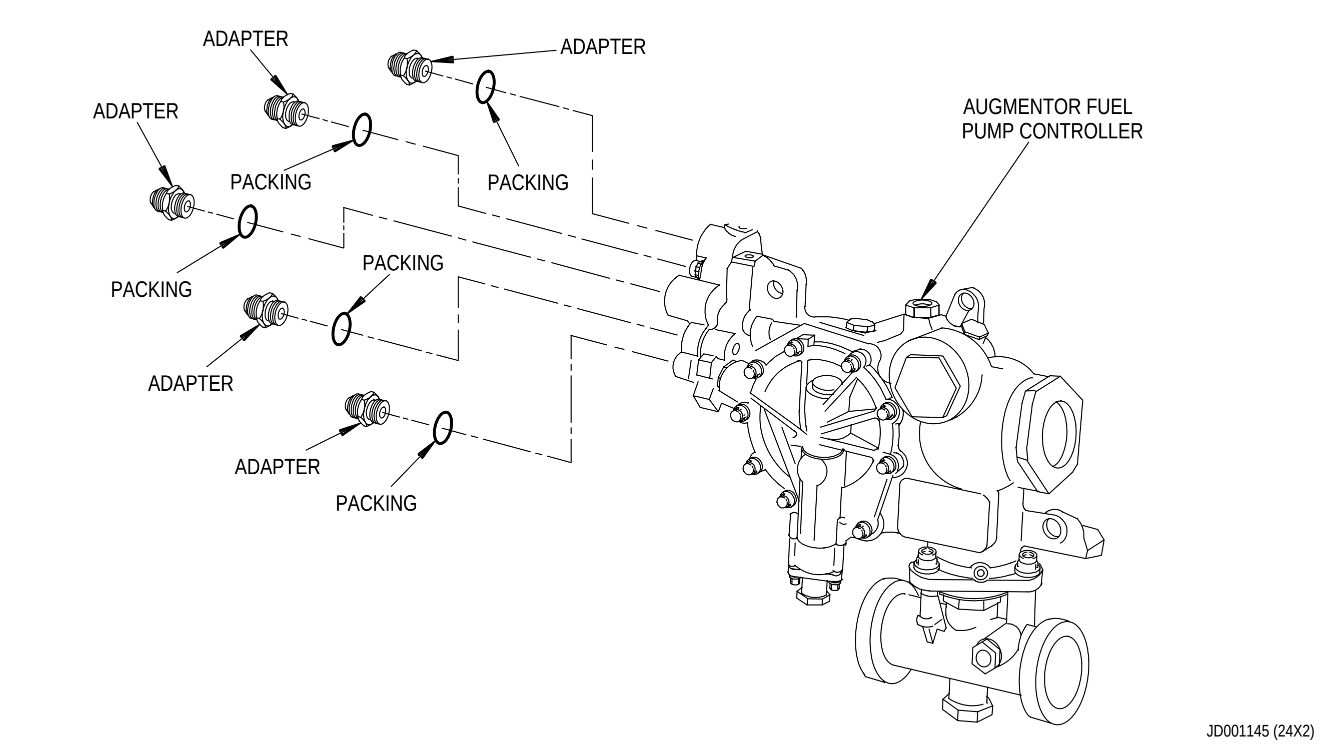


Figure 2. Controller, Augmentor Fuel Pump - Removal of Attaching Parts

4. CONTROLLER, AUGMENTOR FUEL PUMP - CLEANING.

a. Wipe exterior of unit with clean cloth moistened with P-D-680, Type II, petroleum solvent.

b. Dry with clean, dry, lint-free cloth.

5. AUGMENTOR FUEL PUMP CONTROLLER - INSPECTION.
(See Figure 3.)

a. Inspect augmentor fuel pump controller. (See figure 3.)

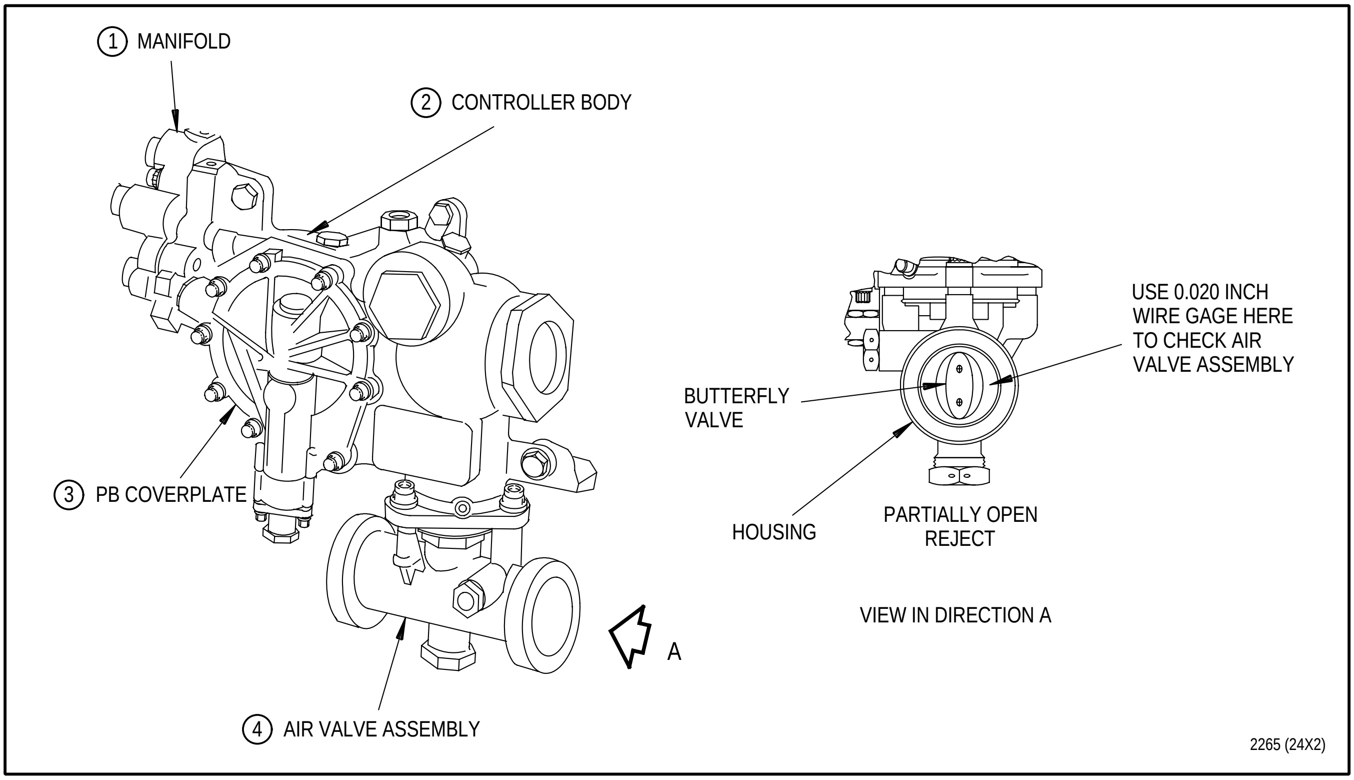
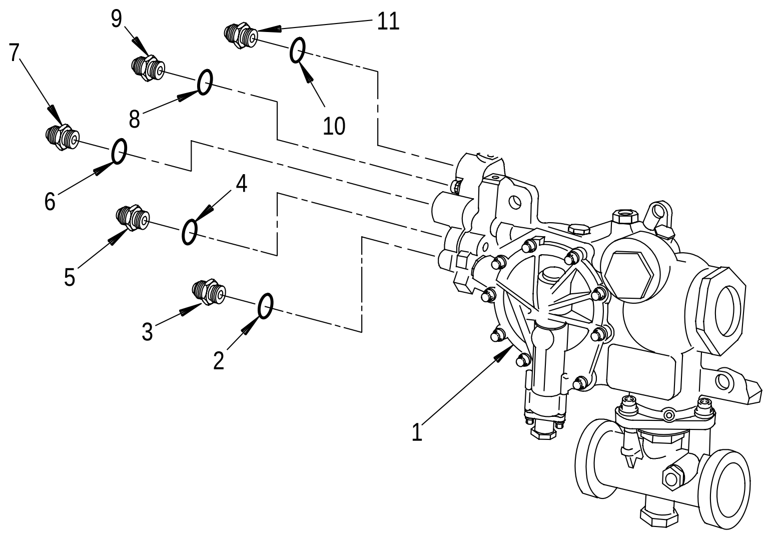


Figure 3. Augmentor Fuel Pump Controller - Inspection

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Manifold -			
Cracked	Not serviceable	Not reparable	Replace controller.
Fuel leakage betweenmanifold and controller body	Not serviceable	Not reparable	Replace controller.
2. Controller body -			
Cracked	Not serviceable	Not reparable	Replace controller.
3. Pb coverplate -			
Cracked	Not serviceable	Not reparable	Replace controller.
Fuel leakage between Pb coverplate and controller body	Not serviceable	Not reparable	Replace controller.
4. Air valve assembly -			
Air valve not fully closed	0.020 inch wire gage between butterfly valve and housing	Not reparable	Replace controller.

6. CONTROLLER, AUGMENTOR FUEL PUMP - INSTALLATION OF ATTACHING PARTS.
(See Figure 4.)

a. Install adapter to controller.
(See figure 4.)



INDEX NUMBER	DESCRIPTION	LUBRICATION	TORQUE (LB-IN.)
1	AUGMENTOR FUEL PUMP CONTROLLER	-	-
2	PN MS9966-05 PACKING	MIL-L-7808	-
3	ADAPTER	-	90 TO 100
4	PN MS9966-06 PACKING	MIL-L-7808	-
5	ADAPTER	-	110 TO 120
6	PN MS9966-05 PACKING	MIL-L-7808	-
7	ADAPTER	-	90 TO 100
8	PN MS9966-04 PACKING	MIL-L-7808	-
9	ADAPTER	-	65 TO 75
10	PN MS9966-04 PACKING	MIL-L-7808	-
11	ADAPTER	-	65 TO 75

JD001147 (36X2)

Figure 4. Controller, Augmentor Fuel Pump - Installation of Attaching Parts

7. CONTROLLER, AUGMENTOR FUEL PUMP - INSTALLATION.

(See Figure 5.)

a. Apply PWA 550 antigalling compound to threads of bolts.

b. Position augmentor fuel pump controller on brackets. Install bolts and washers. Tighten fingertight. (See figure 5, Sheet 1.)

c. Install seal rings and slide collars toward air valve assembly. (See figure 5, Sheet 2.)

d. Apply PWA 550 antigalling compound to threads of coupling clamps.

e. Install coupling clamps to connect controller to augmentor fuel pump air supply manifold and augmentor pump seal tube.

f. Torque coupling tube nuts 55 to 70 pound-inches.

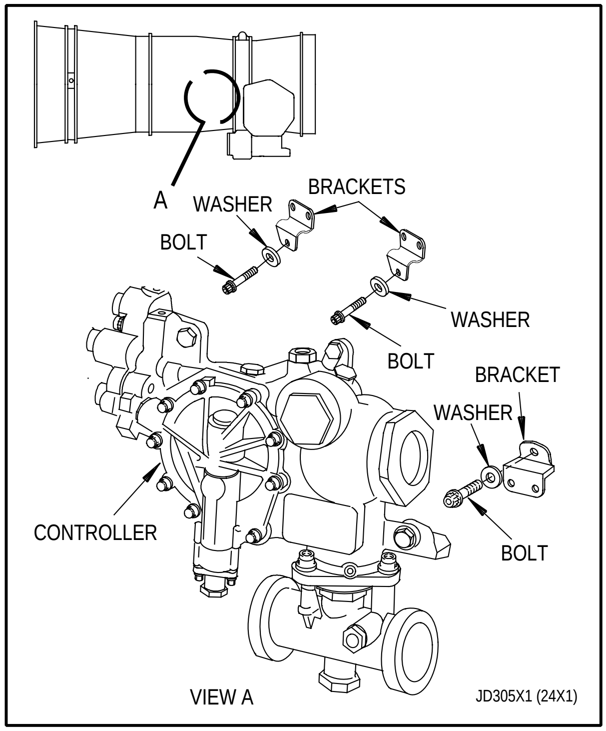


Figure 5. Augmentor Fuel Pump Controller - Installation (Sheet 1 of 4)

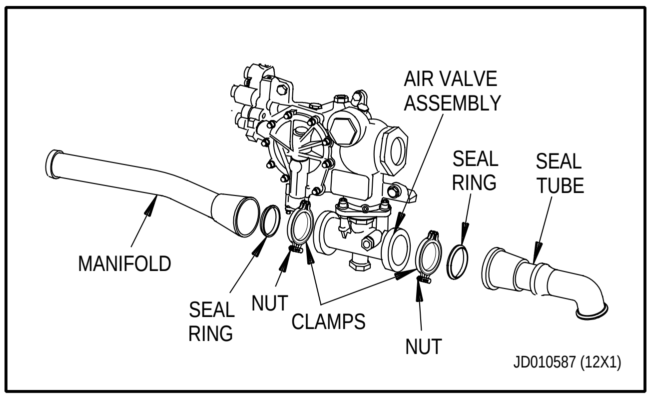


Figure 5. Augmentor Fuel Pump Controller - Installation (Sheet 2 of 4)

g. Torque mount bolts 62 to 72 pound-inches.

h. Apply a light coat of PWA 550 antigalling compound to threads of coupling tube nuts. Remove excess. (See figure 5, Sheet 3.)

i. Connect tubes to controller, and torque coupling tube nuts as shown. (See figure 5, Sheet 4.)

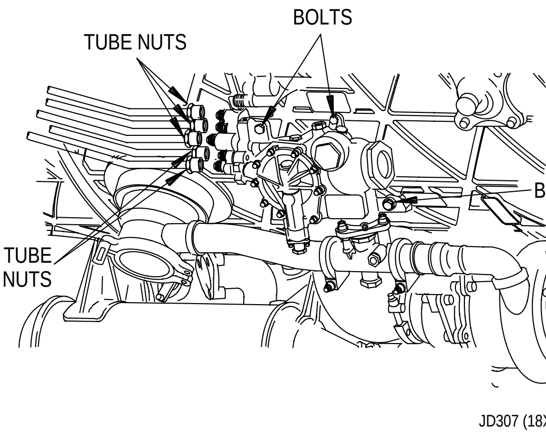


Figure 5. Augmentor Fuel Pump Controller - Installation (Sheet 3 of 4)

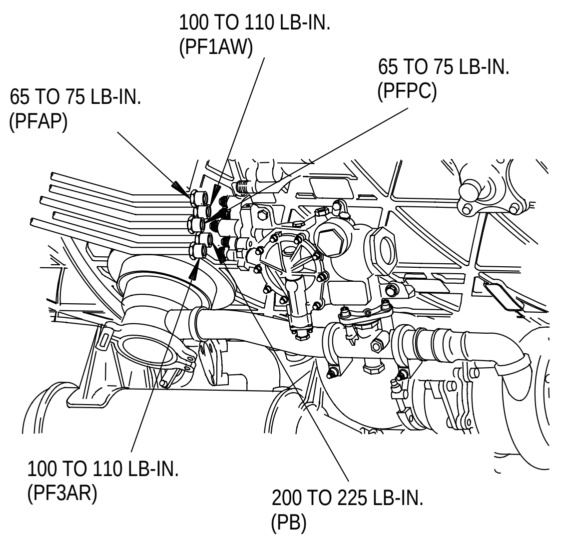


Figure 5. Augmentor Fuel Pump Controller - Installation (Sheet 4 of 4)

8. AUGMENTOR FUEL PUMP CONTROLLER - STORAGE AND SHIPMENT.

a. Install protective closure on Pb port.

NOTE

Preservation is required when a unit is returned to depot or stored for more than 30 days. Units being returned for teardown investigation will be preserved, unless the Service Report disposition instructions advise otherwise.

b. Do not fill Pb port with oil. Damage to pump controller will result.

c. Fill each fuel port with new MIL-L-6081, Grade 1010 oil. Drain excessive oil from unit. Wipe oil from unit.

d. Install all protective closures on open ports.

e. Pack controller in moisture and vapor proof container or wrapping. Seal container or wrapping with moisture proof tape.

f. If controller will be shipped, pack it in a shipping container. Use the original container, if possible. Ensure unit is completely cushioned with shock absorbent material.

9. FOLLOW-ON MAINTENANCE.

a. Perform leak check. Refer to T.O. 2J-F100-11-2, WP 302 00.

WORK PACKAGE

TECHNICAL PROCEDURES

PUMP - FUEL, AUGMENTOR

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 18

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 18	0				

REFERENCE MATERIAL REQUIRED

Title	Number
Hydraulic Pressure Tester PWA 50096 - - - - - - - - - - - - - - -	T.O. 33D4-6-617-1

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Cloth, dry lint-free	
Compound, antigalling, (PWA 550)	Hi-T-650 or Lubri-Bond HT
Compound, antigalling, (PWA 36545)	Everlube 382
Lockwire (0.032 inch diameter)	MS9226-04
Oil, lubricating	MIL-L-6081, Grade 1010
Oil, lubricating	MIL-L-7808
Petrolatum	VV-P-236
Solvent, petroleum	P-D-680, Type II

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Packing, preformed	MS9967-112	1
Packing, preformed	MS9967-113	1
Packing, preformed	MS9967-221	1
Packing, preformed	MS9967-222	1
Retainer	MS28782-26	1
Seal ring, metal	4069472	1

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
8	Augmentor Fuel Pump - Storage and Shipment	
	Tester - Hydraulic Pressure (alternate to PWA 50045) - - - - - - - - - - - - - - - - -	PWA 50096

ILLUSTRATED SUPPORT EQUIPMENT

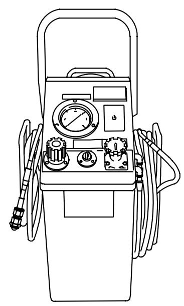


Figure T1. PWA 50096 Tester

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures on the augmentor fuel pump:

- Removal
- Removal of attaching parts
- Cleaning
- Inspection
- Installation of attaching parts
- Installation
- Storage and shipment

2. AUGMENTOR FUEL PUMP - REMOVAL.

(See Figures 1 and 2.)

a. Disconnect overboard drain hose assembly(12, figure 1).

b. Remove bolts(6) and disconnect PF1 fuel inlet tube(7). Remove and discard packing(5).

c. Remove bolts(10) and disconnect PF1A fuel outlet hose assembly(11). Remove and discard packing(8) and retainer(9).

d. Remove lockwire and loosen coupling clamp(14) securing air vent manifold assembly(15). Do not remove cotter pin from bolt when loosening nut and clamp.

e. Remove lockwire and loosen coupling clamp(3) securing air supply tube(1). Do not remove cotter pin from bolt when loosening nut and clamp. Remove and discard metal seal ring(2).

f. Disconnect bearing cooling hose assembly(4).

g. Support augmentor fuel pump. Remove bolts, washers, and nuts that secure fuel pump to front fan duct. (See figure 2.)

h. Remove pump.

i. Purge all fuel from fuel inlet, fuel outlet, and overboard drain ports of augmentor fuel pump.

j. Install protective closures on air and fuel ports.

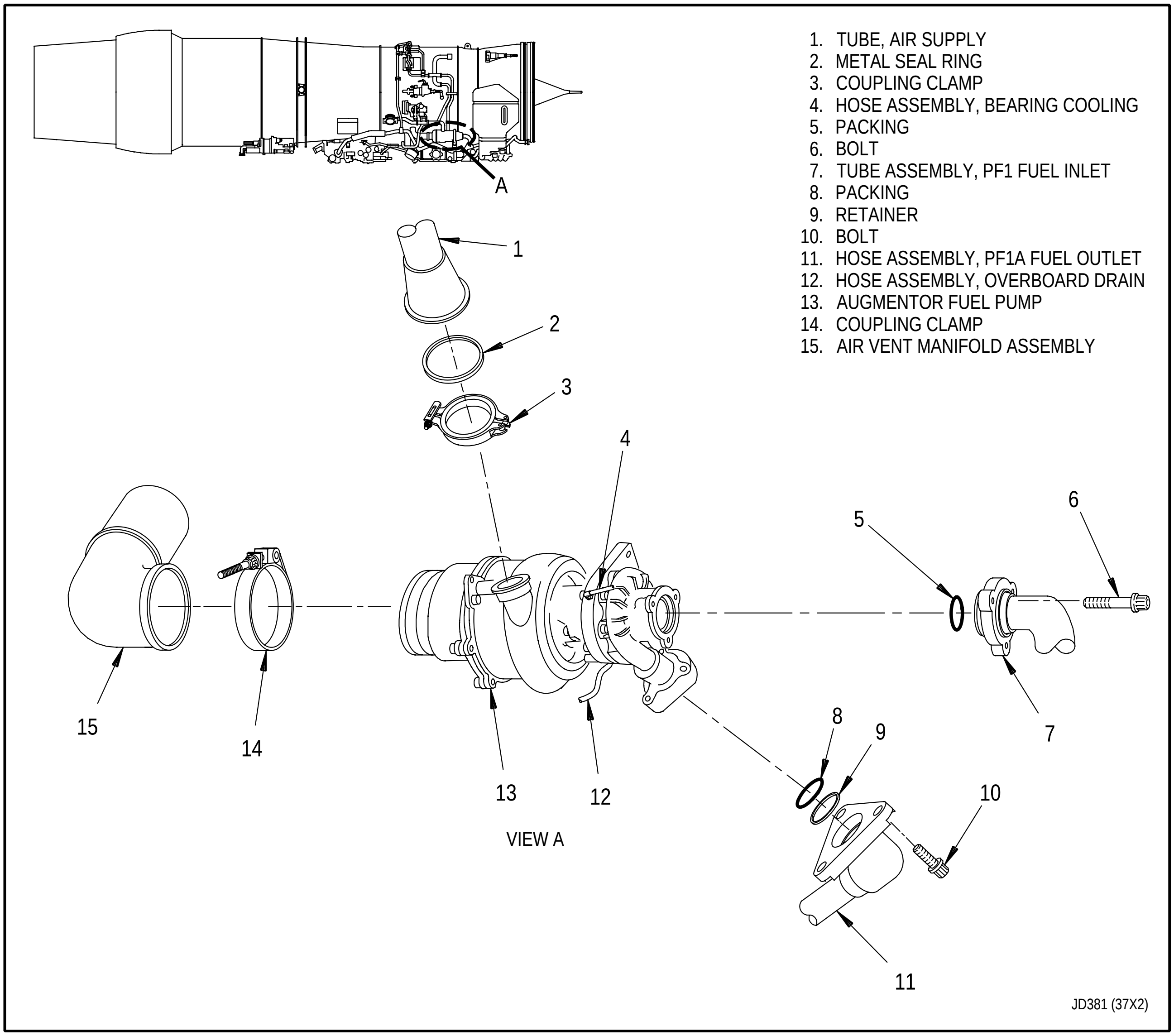


Figure 1. Augmentor Fuel Pump - Disconnect Tubes and Hoses

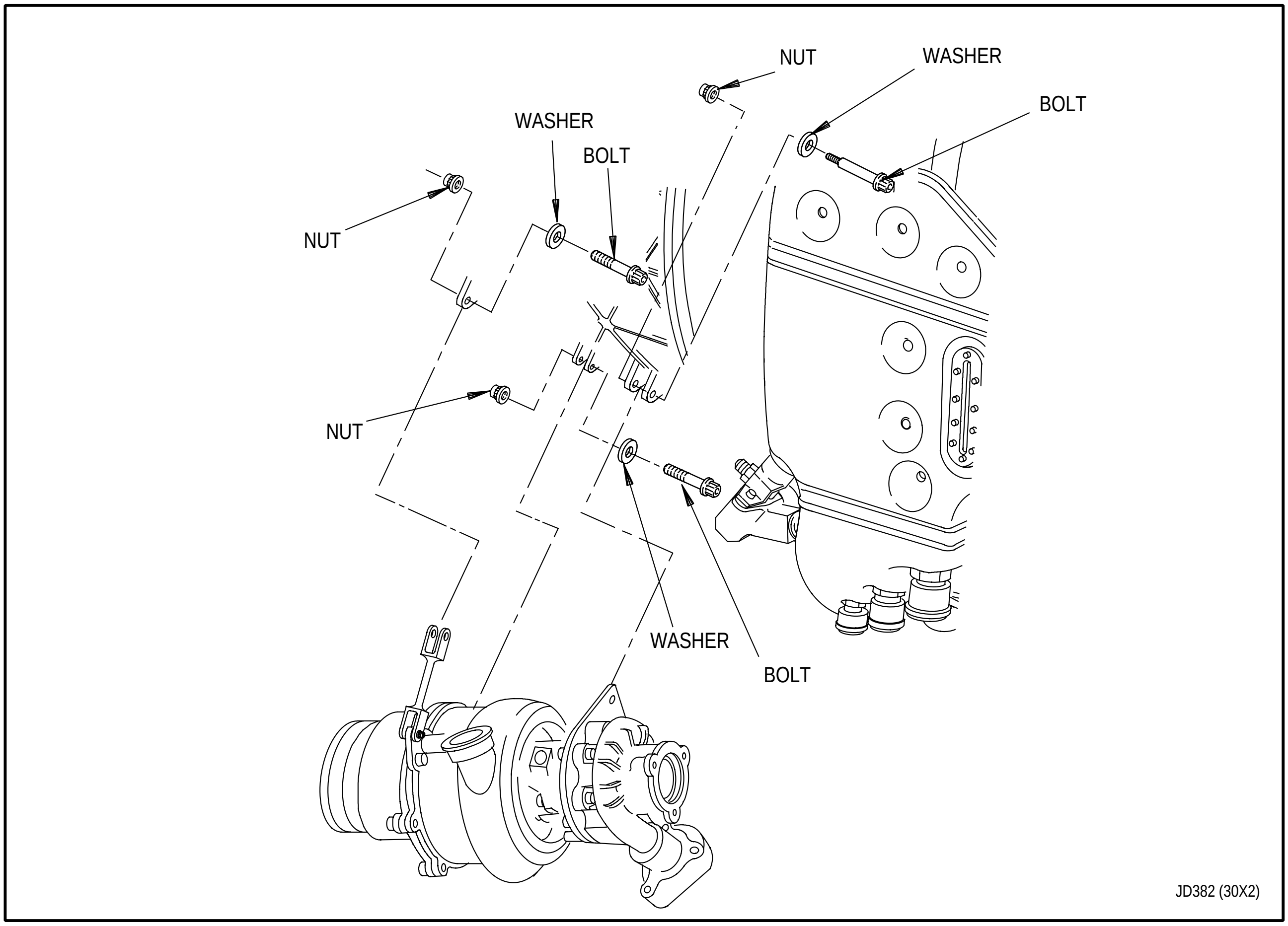


Figure 2. Augmentor Fuel Pump - Removal

3. AUGMENTOR FUEL PUMP - REMOVAL OF ATTACHING PARTS.
(See Figure 3.)

a. Remove bolt, washer, and nut securing mounting link to pump flange. Remove link. (See figure 3.)

b. Remove adapters and discard packings.

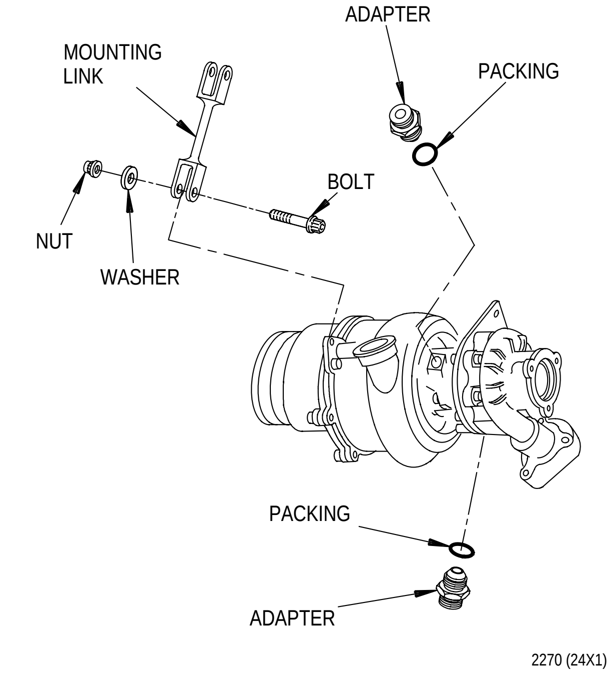


Figure 3. Augmentor Fuel Pump - Removal of Attaching Parts

4. AUGMENTOR FUEL PUMP - CLEANING.

a. Wipe exterior of pump with clean cloth moistened with P-D-680, Type II petroleum solvent.

b. Dry with clean, dry lint-free cloth.

5. AUGMENTOR FUEL PUMP - INSPECTION.

a. Inspect all threads, sealing surfaces, and mounting provisions of pump.

b. Check impeller inside front of pump for freedom of rotation.

c. Replace pump with indications of any damage.

6. AUGMENTOR FUEL PUMP - INSTALLATION OF ATTACHING PARTS.

(See Figure 4.)

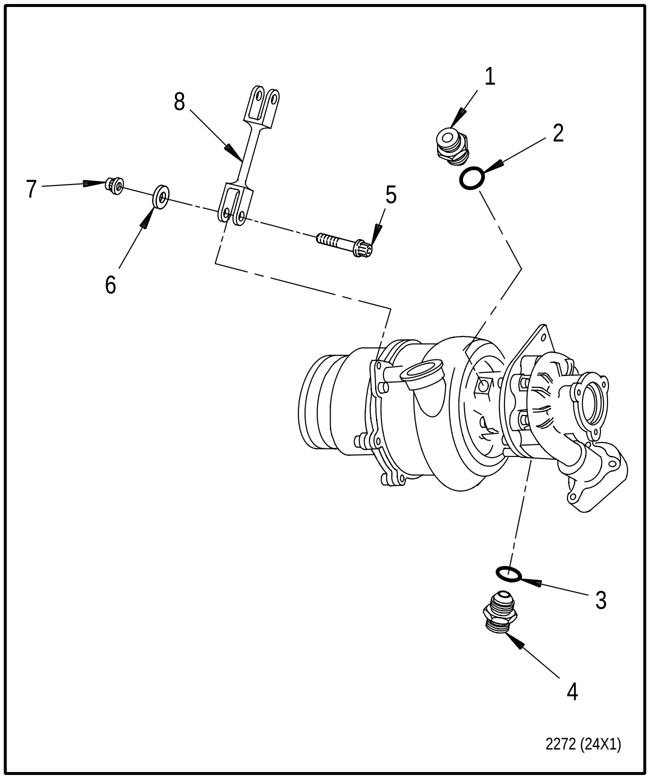
a. If required, remove corrosion preventive compound from pump by wiping with clean cloth moistened with P-D-680, Type II petroleum solvent.

b. Lubricate packings(2 and 3, figure 4) using VV-P-236 petrolatum and install on adapters(1 and 4.)

c. Lubricate threads of adapters(1 and 4) using MIL-L-7808 oil and install into pump. Tighten adapters 110 to 120 pound-inches.

d. Lubricate threads of bolt(5) using PWA 36545 antigalling compound.

e. Secure mounting link(8) to pump using bolt(5), nut(7), and washer(6) handtight. Do not torque nut(7) at this time.



1. Adapter
2. Packing MS9967-112
3. Packing MS9967-112
4. Adapter
5. Bolt
6. Washer
7. Nut
8. Mounting link

Figure 4. Augmentor Fuel Pump - Installation of Attaching Parts

7. AUGMENTOR FUEL PUMP - INSTALLATION.
(See Figures 5 and 6.)

a. Apply a light coat of PWA 36545 antigalling compound to nuts(1, 2, and 5, figure 5). Remove excess.

b. Support augmentor fuel pump during installation.

c. Position pump(10) on mounting lugs on front fan duct and secure with bolts(4, 7, and 9,) washers(3, 6, and 8), and nuts(1, 2, and 5). Do not torque nuts at this time.

d. Secure air vent manifold(15, figure 6) to pump with coupling clamp(14). Do not torque coupling clamp nut at this time.

e. Install metal seal ring(2) and secure air supply tube to pump with coupling clamp(3). Do not torque coupling clamp nut at this time.

f. Apply a light coat of PWA 36545 antigalling compound to bolts(6). Remove excess.

g. Lubricate packing(5) using VV-P-236 petrolatum and position in groove of PF1 fuel inlet tube(7).

h. Connect PF1 fuel inlet tube(7) to pump(13) using bolts(6). Do not torque bolts at this time.

i. Apply a light coat of PWA 550 antigalling compound to bolts(10). Remove excess.

j. Lubricate packing(8) using VV-P-236 petrolatum.

k. Install packing(8) then retainer(9) onto pump(13).

l. Connect PF1A fuel outlet tube(11) to pump(13) using bolts(10). Do not torque bolts at this time.

NOTE

Tube coupling nut threads do not require lubricant.

m. Connect overboard drain hose(12) coupling nut to pump(13) handtight.

n. Connect bearing cooling hose(4) coupling nut to pump(13) handtight.

o. Torque pump mounting bolt(4, figure 5) and nut(2) at fan case 62 to 72 pound-inches.

p. Torque augmentor fuel pump lower mount bolts(7, and 9), and nuts(1, and 5) 62 to 72 pound-inches.

q. Torque air vent coupling(14, figure 6) clamp nut 30 to 50 pound-inches. Lockwire using MS9226-04 wire.

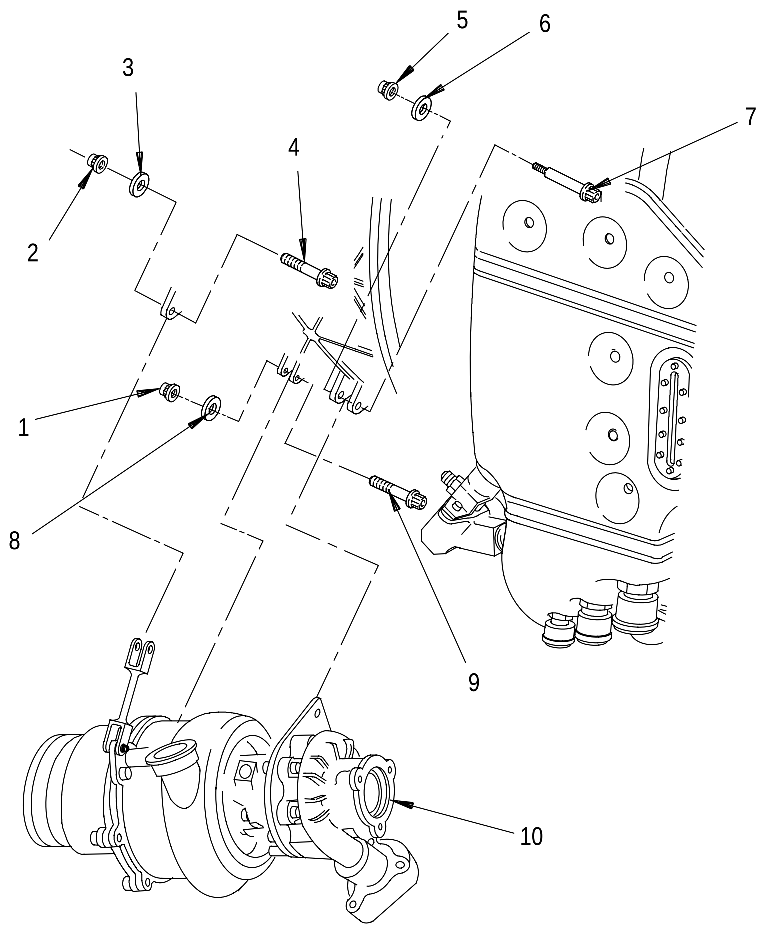
r. Torque air supply tube coupling clamp(3) nut 55 to 70 pound-inches. Lockwire using MS9226-04 wire.

s. Torque PF1 fuel inlet tube bolts(6) 65 to 75 pound-inches. Lockwire using MS9226-04 wire.

t. Torque PF1A fuel outlet tube bolts(10) 190 to 215 pound-inches.

u. Torque overboard drain hose coupling nut(12) 340 to 375 pound-inches. Lockwire using MS9226-04 wire.

v. Torque bearing cooling hose coupling nut(4) 200 to 225 pound-inches. Lockwire using MS9226-04 wire.



1. Nut
2. Nut, pump mounting link
3. Washer
4. Bolt, pump mounting link
5. Nut
6. Washer
7. Bolt
8. Washer
9. Bolt
10. Augmentor fuel pump

Figure 5. Augmentor Fuel Pump - Installation

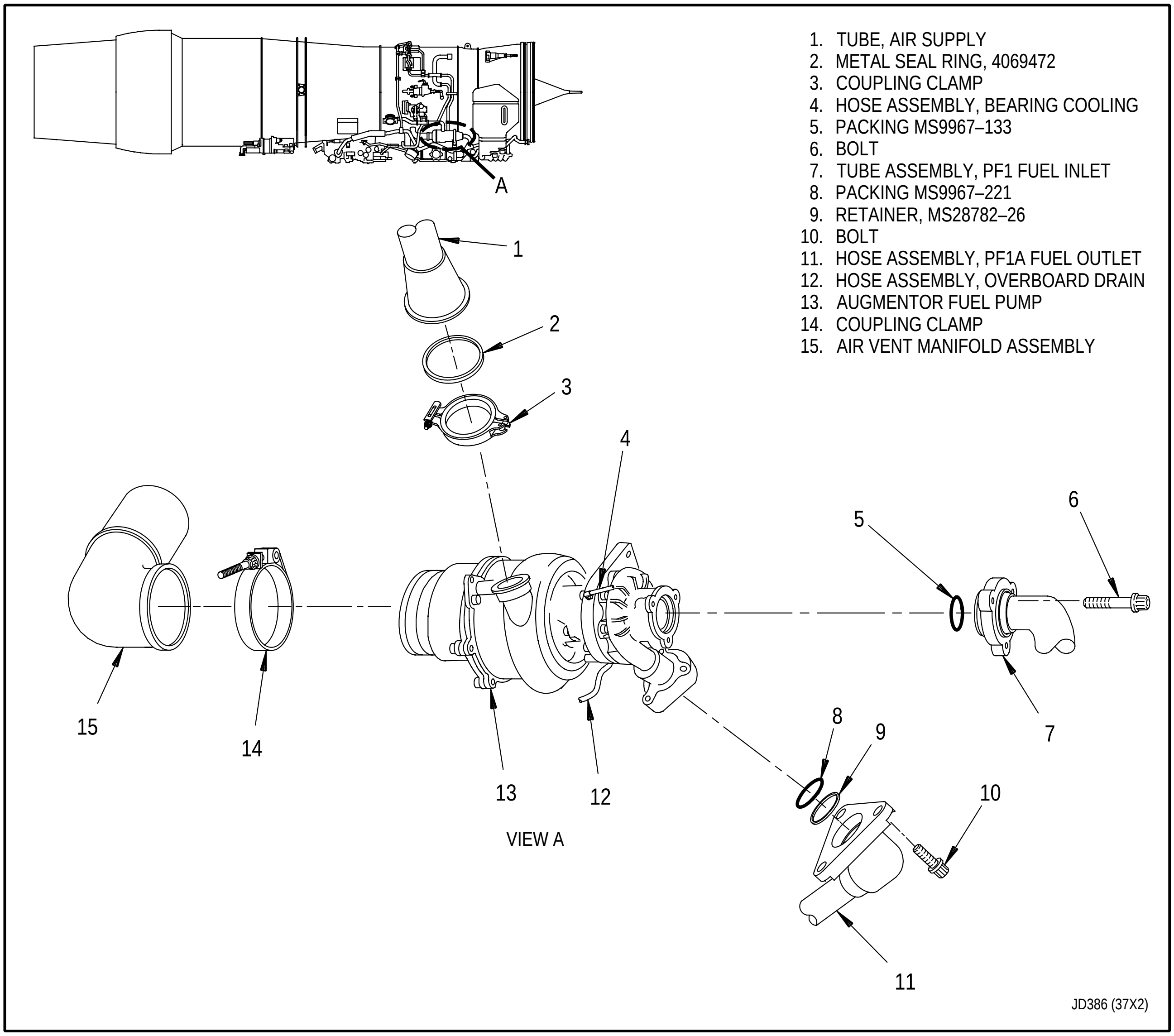


Figure 6. Augmentor Fuel Pump - Attaching Tubes and Hoses

8. AUGMENTOR FUEL PUMP - STORAGE AND SHIPMENT.

(See Figures 7 and 8.)

NOTE

Preservation is required when a unit is returned to depot or stored for more than 30 days. Units being returned for teardown investigation will be preserved, unless the Service Report disposition instructions advise otherwise.

a. Drain all fuel from fuel inlet, fuel outlet, and overboard drain port of pump.

NOTE

Refer to T.O. 33D4-6-617-1 (Hydraulic Pressure Tester PWA 50096) for instructions on operation of tester.

b. Using PWA 50096 tester with MIL-L-6081, Grade 1010 oil, preserve augmentor fuel pump as follows: (See figure 7.)

(1) Verify that PWA 50096 tester has clean 10 micron filter installed and that liquid level indicator shows maximum oil level.

(2) Place PN MS9967-112 packing onto PN ST2091-062 adapter. Install adapter into augmentor fuel pump BRG FUEL OUT boss.

(3) Locally manufacture Fixture A. Install Fixture A onto fuel outlet port using three 0.250-28 UNJF-3A x 1.250 inch long work bolts.

(4) Locally manufacture fixture B. Place PN MS9967-222 packing, or equivalent, onto Fixture B. Install Fixture B onto fuel inlet port using three 0.250-28 UNJF-3A x 0.750 inch long work bolts.

CAUTION

Oil supply system contamination may cause damage to augmentor fuel pump bearings.

(5) Before connecting oil supply to augmentor fuel pump, verify cleanliness of lines, fittings, adapter, and pump boss downstream of tester filter.

(6) Remove quick-disconnect coupling from end of tester RETRACT hose.

(7) Stand pump vertically with impeller housing upward. Connect RETRACT hose to adapter in BRG FUEL OUT port.

CAUTION

Over pressurization will damage augmentor fuel pump seals.

(8) Turn PWA 50096 tester regulator valve fully counterclockwise (to low pressure) before supplying power to tester.

(9) Turn PWA 50096 tester on. Adjust regulator valve to obtain 20 ± psig on gage.

(10) Position selector valve to RETRACT allowing oil to flow into BRG FUEL OUT port. Continue oil flow for at least 2 minutes after a steady flow of oil is observed exiting augmentor fuel pump.

(11) Shut down PWA 50096 tester.

(12) Disconnect oil supply. Keep RETRACT line and quick-disconnect coupling clean.

(13) Remove adapter from BRG FUEL OUT port.

(14) Install closures (figure 8) on FUEL OUTLET and BRG FUEL OUT ports.

(15) Fill impeller housing with clean MIL-L-6081, Grade 1010 oil.

(16) Invert pump; drain excess oil.

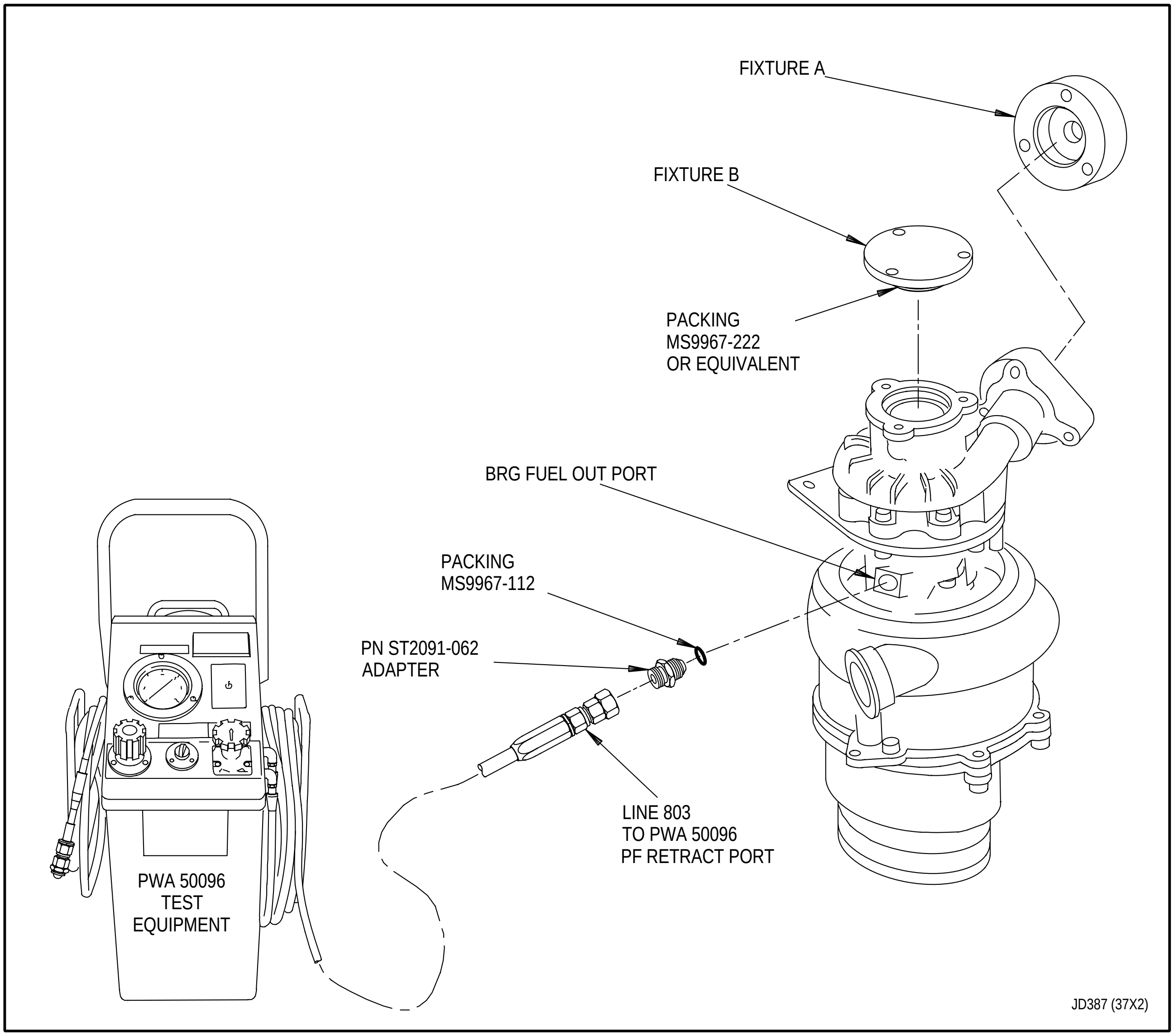


Figure 7. Augmentor Fuel Pump Preservation (Sheet 1 of 2)

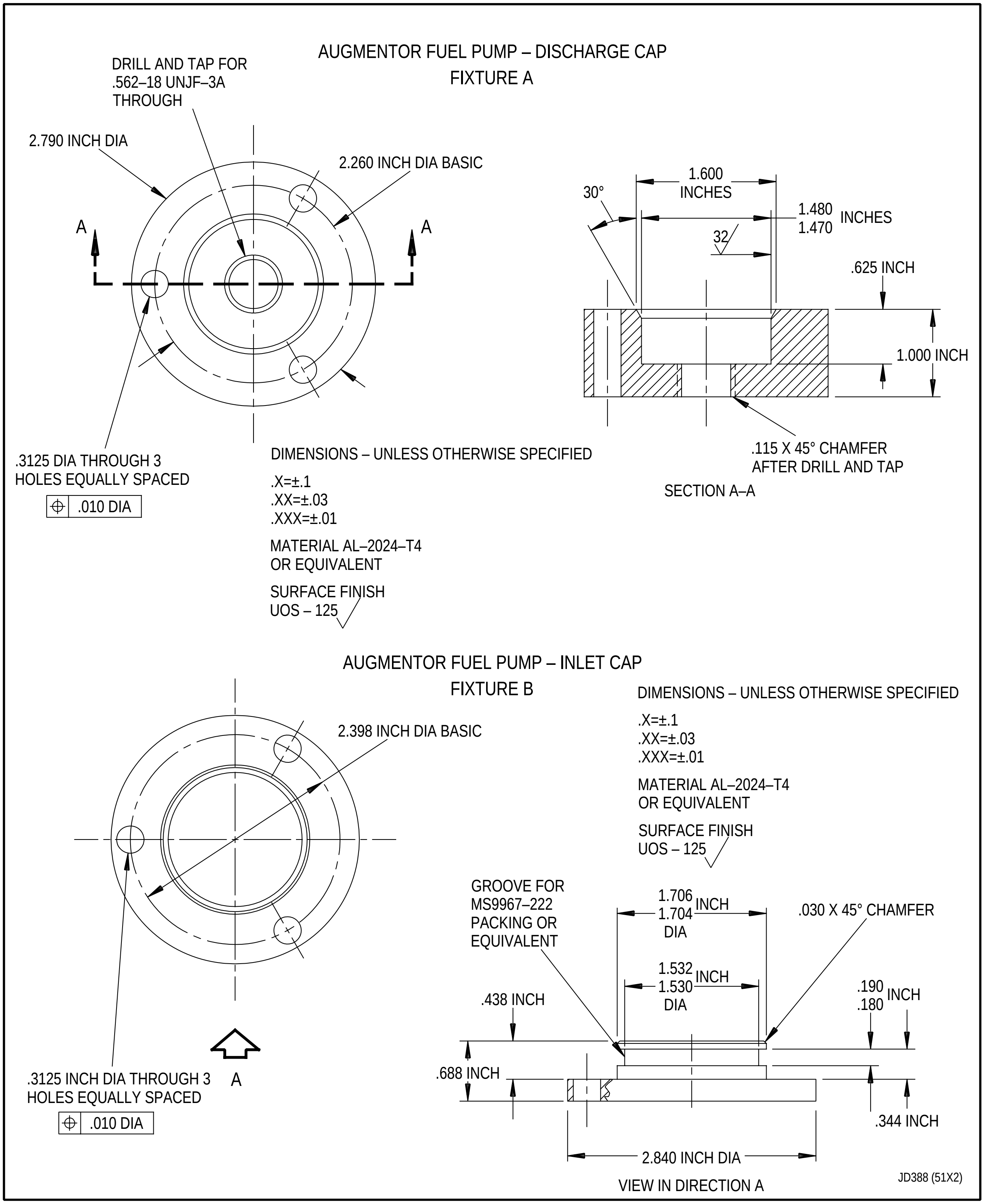


Figure 7. Augmentor Fuel Pump Preservation (Sheet 2 of 2)

c. Wipe all excess oil from external surfaces, and install shipping closures to prevent preservation oil drip during shipment or storage. (See figure 8.)

d. If pump is to be shipped, pack it in shipping container. Ensure unit is securely mounted on mounting pad and thoroughly cushioned with shock absorbent material. Use original shipping container, if possible.

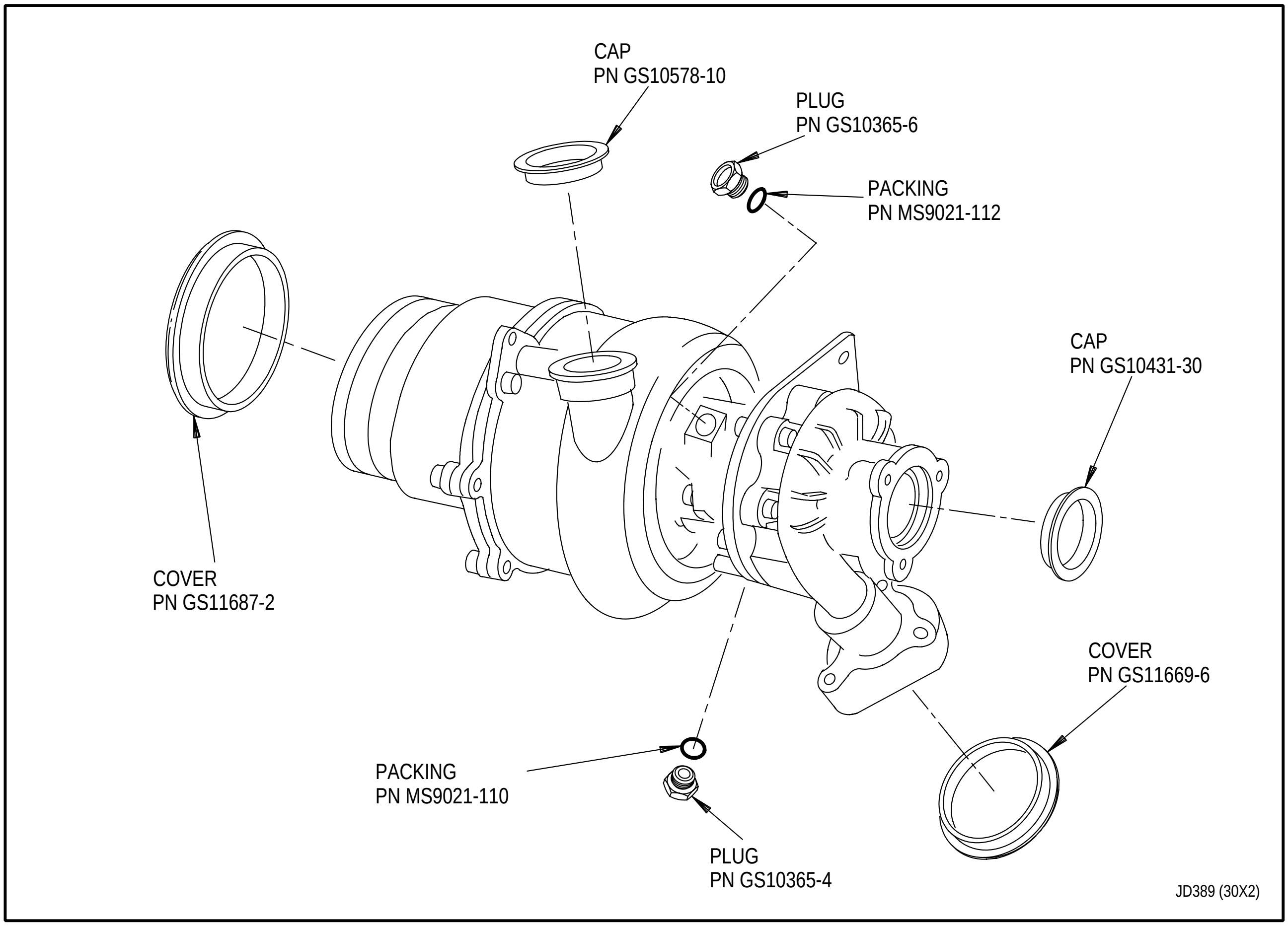


Figure 8. Augmentor Pump - Storage and Shipment

WORK PACKAGE

TECHNICAL PROCEDURES

SENSOR - ELECTRICAL, QUAD N1

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 12

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	30	4 - 6	30	9 - 12	30
2	21	6A - 6B Deleted	30	13 - 15 Deleted	30
3	0	7 - 8	0	16 Blank Deleted	30

REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information - - - - - - - - - - - - - -	T.O. 2J-F100-53-1
General Procedures -	WP 021 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Alcohol or	O-E-760, Type III
Alcohol, isopropyl	TT-I-735 Grade A, or PMC 9016
Brush, stiff-bristled, nonmetallic	-
Cloth, dry, lint-free	-
Compound, antigalling (PWA 550)	Hi-T-650
Compound, sealing (PWA 36000-2 or PWA 36000-3)	SQ32M
Lockwire (0.025 inch diameter)	MS9226-03
Lockwire (0.032 inch diameter)	MS9226-04
Oil, lubricating	MIL-L-7808 or
Petrolatum (alternate to oil)	VV-P-236
Solvent, dielectric	PMC 8910

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Key washer	4064164	1
Packing, preformed	AS3209-150	1
Packing, preformed	ST1000-150	1

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
2	Quad N1 Electrical Sensor - Removal	
	Adapter, anti-icing cone retaining nut	PWA 57609
4	Quad N1 Electrical Sensor and Quad N1 Sensing Special Purpose Electrical Cable - Inspection	
	Ohmmeter -	PSM-6 or equivalent
5	Quad N1 Electrical Sensor - Installation	
	Adapter, anti-icing cone retaining nut	PWA 57609

ILLUSTRATED SUPPORT EQUIPMENT

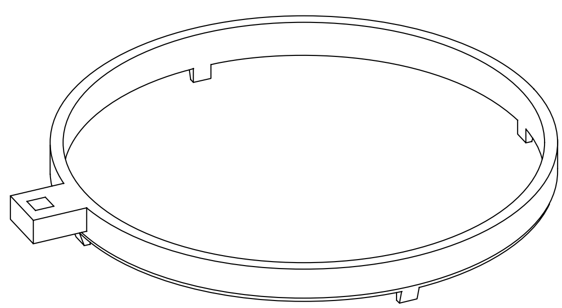


Figure T1. PWA 57609 Adapter

1. INTRODUCTION.

a. This work package contains the following maintenance procedures for the quad N1 electrical sensor:

- Removal
- Cleaning
- Inspection
- Installation

2. QUAD N1 ELECTRICAL SENSOR - REMOVAL.

(See Figure 1A.)

WARNING

While working near or prior to handling Ps2 probe, allow probe adequate cooling time and avoid unintentional physical contact with probe. Hot probe may cause severe burns, and probe length is sufficient to cause personal injury.

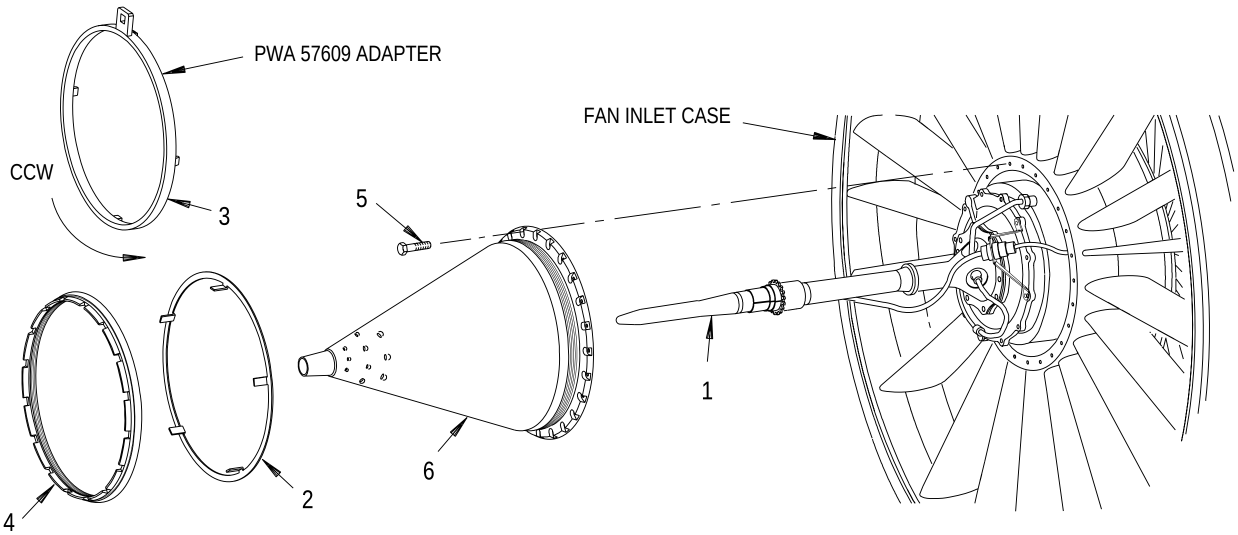
a. Remove quad N1 electrical sensor. See figure 1A.

Figure 1. Deleted.

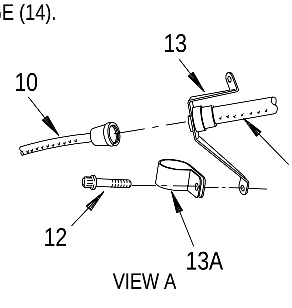
WARNING

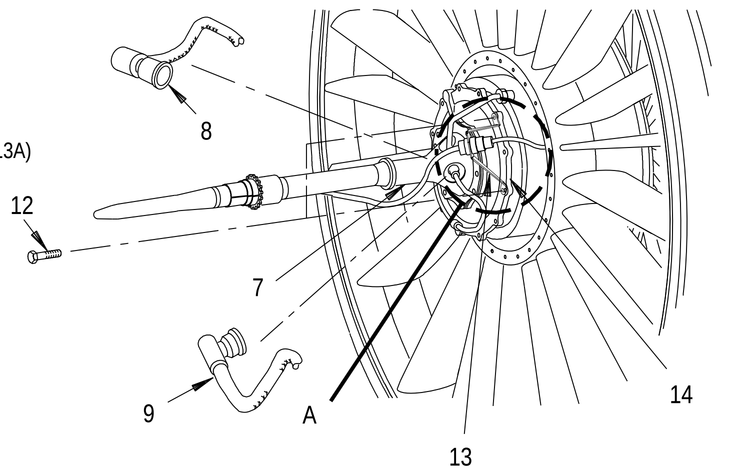
Ps2 PROBE ASSEMBLY (1) CAN RETAIN HEAT FOR LONG PERIODS OF TIME. DO NOT TOUCH WITH BARE HANDS.

a. STRAIGHTEN TAB OF KEY WASHER (2).
b. USING PWA 57609 ADAPTER (3), REMOVE NUT (4).
c. REMOVE KEYWASHER (2).
d. REMOVE BOLTS (5) SECURING ANTI–ICING CONE (OUTER) (6).
e. REMOVE ANTI–ICING CONE (OUTER).



f. DISCONNECT N1 ELECTRICAL CABLE CONNECTORS (8) AND (9) FROM N1 SENSOR.
g. DISCONNECT PS2 PROBE ELECTRICAL CONNECTOR (10) FROM RECEPTACLE (11).
h. REMOVE BOLTS (12) AND LOCKWIRE SECURING CABLE BRACKET (13) AND CABLE LOOP CLAMP (13A) TO COMPRESSOR INLET INLET CONE SUPPORT FLANGE (14).





108286 (48X2)

Figure 1A. Quad N1 Electrical Sensor - Removal (Sheet 1 of 2)

i DISCONNECT PS2 PRESSURE TUBE (15) FROM FITTING ON FAN INLET CASE.
j. REMOVE EIGHT BOLTS (16) AND THREE CABLE LOOP CLAMPS (17). MOVE CABLE BRACKET (13) AWAY FROM FLANGE.
k. REMOVE PS2 PROBE (1) AND ANTI–ICING CONE (INNER) (7) AS A UNIT.
l. REMOVE QUAD N1 ELECTRICAL SENSOR (18) FROM FAN INLET CASE. DISCARD PACKING (19).

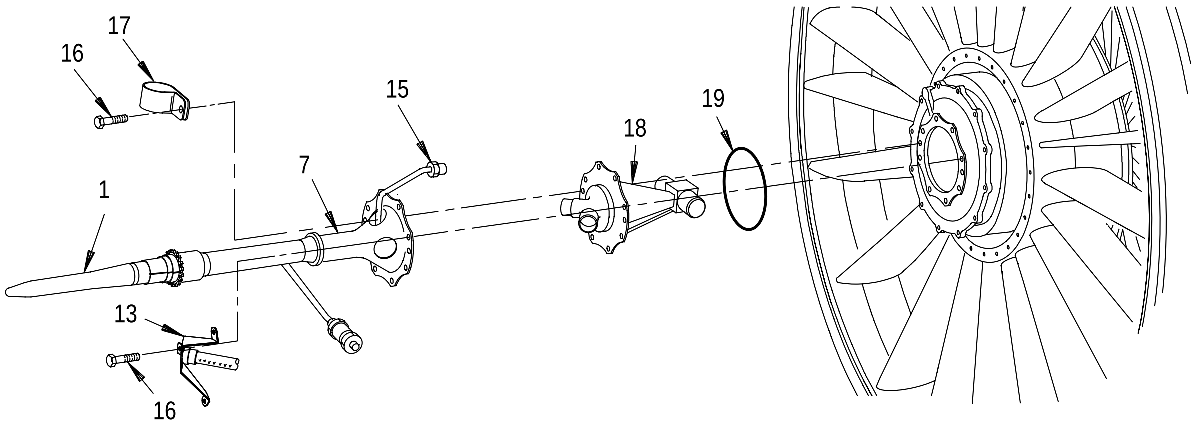


Figure 1A. Quad N1 Electrical Sensor - Removal (Sheet 2 of 2)

3. QUAD N1 ELECTRICAL SENSOR - CLEANING.

a. Clean quad N1 electrical sensor with a nonmetallic, stiff-bristled brush using denatured alcohol, O-E-760, Type III.

b. Clean connector pins and threads by spraying with isopropyl alcohol (TT-I-735 Grade A), or PMC 9016, or dielectric solvent PMC 8910.

c. Dry with clean, dry lint-free cloth. If necessary, blow dry with clean compressed air at less than 30 psi.

Pages 6A and 6B deleted.

4. QUAD N1 ELECTRICAL SENSOR AND QUAD N1 SENSING SPECIAL PURPOSE ELECTRICAL CABLES - INSPECTION.

(See Figures 2 and 3.)

NOTE

Allow sensor to reach temperature of surrounding area prior to performing electrical checks to obtain accurate resistance readings.

a. Visually inspect quad N1 sensor. (See figure 2.)

b. Using PSM-6 ohmmeter, or equivalent, perform electrical check as follows:

(1) Connector N1 A and B, measure resistance between Pins A and B, and between pins C and D. Resistance shall be 48 ±10 ohms.

(2) Connector N1 C and D, measure resistance between Pins A and B, and between Pins C and D. Resistance shall be 204 ±30 ohms.

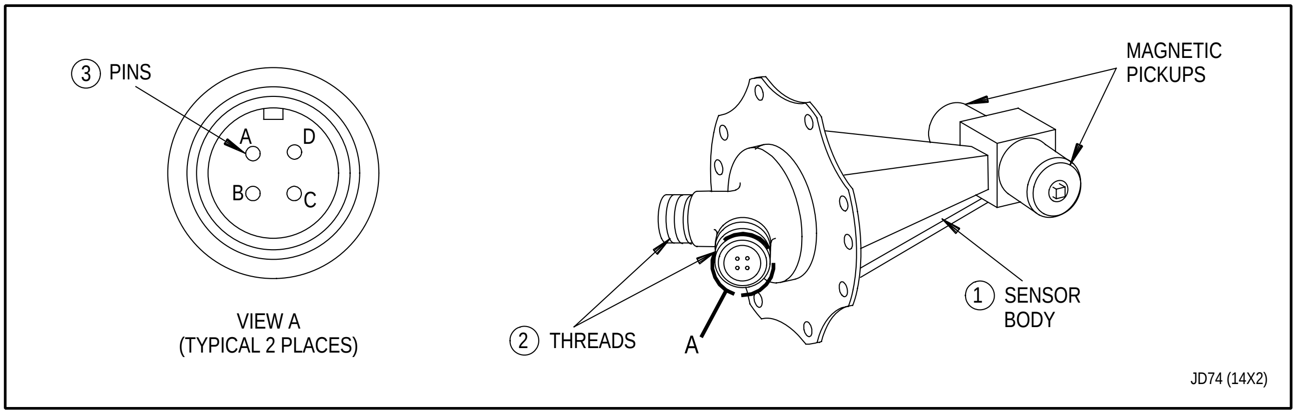
c. Using a DC megohmmeter at 50VDC, measure insulation resistance at connectors N1 A and B and N1 C and D as follows:

(1) Measure insulation resistance between Pin A and sensor shell, Pin C and sensor shell, and between Pins A and C. Resistance shall be at least 1.0 megohms.

d. Inspect magnetic pickups to ensure they are free of metallic objects.

e. Using PSM-6 ohmmeter, or equivalent, perform insulation resistance check on N1 sensing special purpose electrical cables in fan/inlet case. Resistance of terminal A to ground, B to ground, C to ground, and D to ground shall be one megohm minimum. (See figure 3.)

f. Inspect sensor electrical connectors for bent pins. Refer to T.O. 2J-F100-53-1, WP 021 00.



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Sensor body -			
Bent, cracked, damaged or dents	Not serviceable	Not reparable	Replace sensor.
2. Threads -			
Stripped or crossed	Not serviceable	See corrective action.	Repair minor thread damage with small file or thread chaser. Replace sensor if damage degrades integrity of threads.
3. Pins -			
Missing or cracked pins	Not serviceable	Not reparable	Replace sensor.

Figure 2. Quad N1 Electrical Sensor - Inspection

LIMITS – 1 MEGOHM MINIMUM AT EACH TEST POINT

CONTACT	A	B	C	D	GND
A		X	X	X	X
B			X	X	X
C				X	X
D					X

NOTE

"X" MARKS SHOW POINTS BEING TESTED WITH CONTACT IN LEFT COLUMN. CROSSHATCHED AREA INDICATES NO MEASUREMENTS REQUIRED.

JD75 (14X2)

Figure 3. Quad N1 Sensing Electrical Cable Installation Resistance Check

5. QUAD N1 ELECTRICAL SENSOR - INSTALLATION.

(See Figure 5.)

a. Ensure quad N1 electrical sensor magnetic pickups are free of magnetic particles.

b. Install N1 sensor. See figure 5.

Figure 4. Deleted.

a. INSTALL NEW LUBRICATED PACKING (1) IN GROOVE OF QUAD N1 ELECTRICAL SENSOR (2).
b. ALIGN DOWEL PIN HOLES IN SENSOR WITH DOWEL PINS IN COMPRESSOR INLET CONE SUPPORT (3), AND INSTALL SENSOR IN SUPPORT.
c. APPLY A THIN COAT OF PWA 36000–2 OR PWA 36000–3 SEALING COMPOUND TO THREADS OF EIGHT BOLTS (4). ALLOW SEALING COMPOUND TO SET 10 MINUTES BEFORE INSTALLING BOLTS.
d. APPLY A LIGHT COAT OF PWA 550 ANTI–GALLING COMPOUND ON TUBE NUT (5) THREADS. REMOVE EXCESS.

CAUTION

ENSURE SPACER IS PROPERLY INSTALLED ON PS2 PROBE. FAILURE TO DO SO COULD RESULT IN SEVERE PROBE OR ENGINE DAMAGE.

NOTE

ENSURE SPRING IS INSTALLED IN INNER ANTI–ICING CONE ASSEMBLY.

e. POSITION PS2 PROBE ASSEMBLY (6) AND ANTI–ICING CONE ASSEMBLY (INNER) (7) ON QUAD N1 SENSOR (2). SECURE BOLT (4) IN 1 O'CLOCK POSITION FINGERTIGHT.
f. CONNECT PS2 TUBE (9) TO FITTING ON FAN INLET CASE. DO NOT TORQUE TUBE NUT AT THIS TIME.
g. POSITION CABLE BRACKET (10), WITH CLAMP (17), ONTO ANTI–ICING CONE ASSEMBLY (INNER) (7).
h. POSITION LOOP CLAMPS (17) FOR QUAD N1 SENSING CABLE (18) ON ANTI–ICING CONE FLANGE AS SHOWN IN FIGURE 5, SHEET 2, AND INSTALL REMAINING BOLTS (4). TORQUE EIGHT BOLTS (4) 32 TO 36 LB–IN.
i. TORQUE TUBE NUT (5) 40 TO 45 LB–IN.
j. APPLY A LIGHT COAT OF PWA 550 ANTI–GALLING COMPOUND TO THREADS OF BOLTS (11). REMOVE EXCESS.
k. INSTALL BOLTS (11) SECURING CABLE BRACKET (10) TO COMPRESSOR INLET CONE SUPPORT FLANGE (12). TORQUE BOLTS 23 TO 26 LB–IN.
l. LOCKWIRE ALL BOLTS (4 AND 11) AND TUBE NUT (5) WITH PN MS9226–04 LOCKWIRE. LOCKWIRE TUBE NUT (5) TO UPPER BOLT (4) SECURING CABLE BRACKET (10).

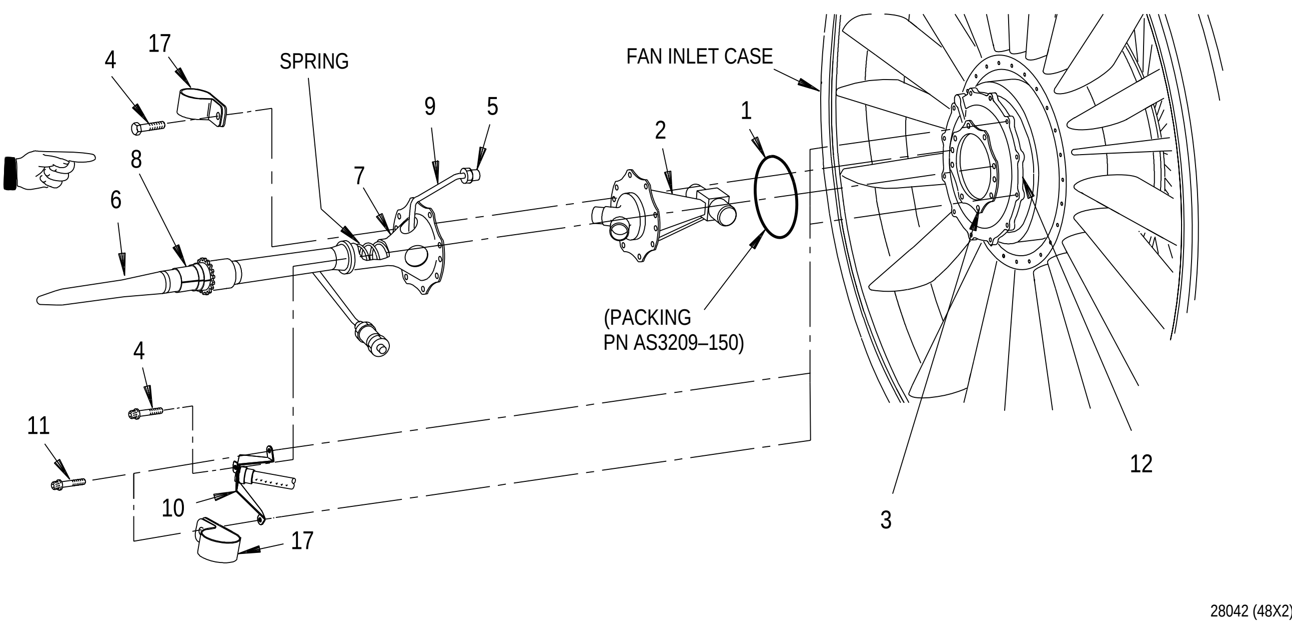


Figure 5. Quad N1 Electrical Sensor - Installation (Sheet 1 of 3)

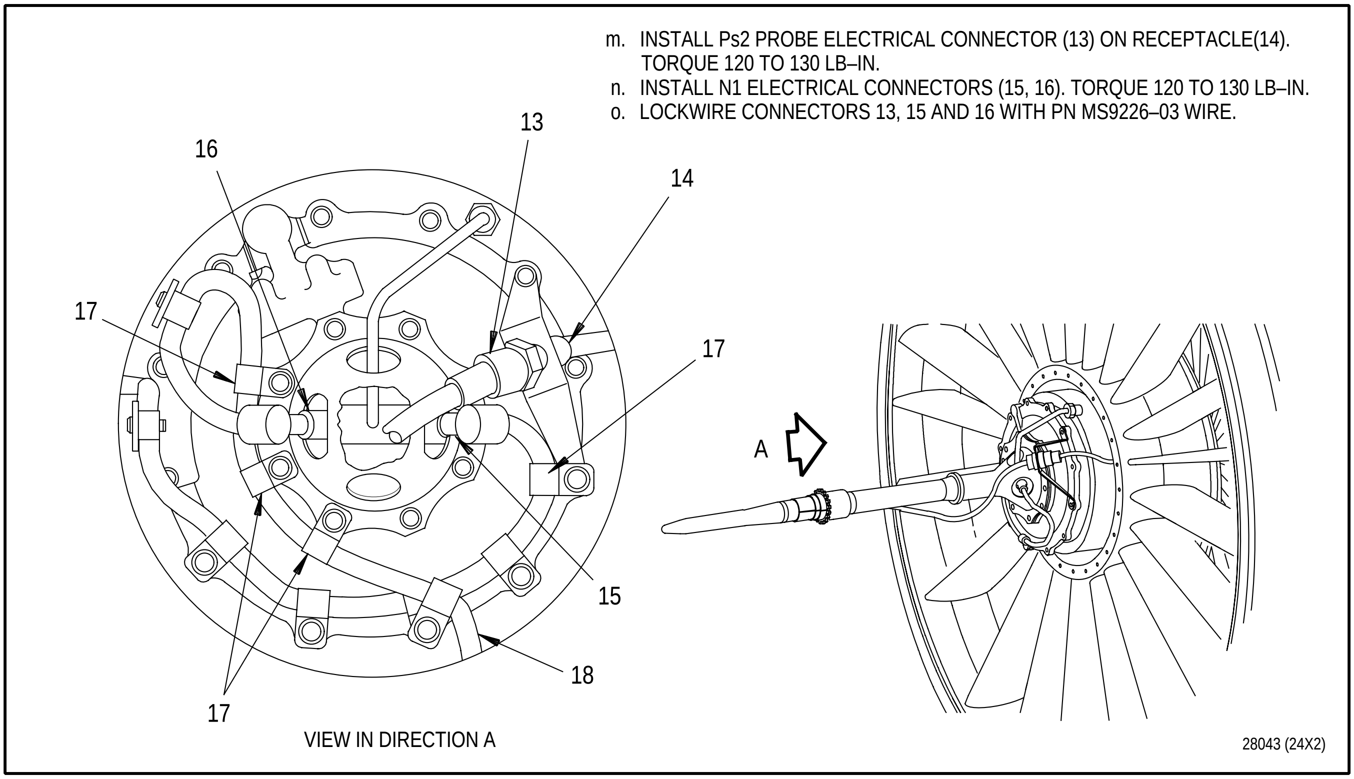


Figure 5. Quad N1 Electrical Sensor - Installation (Sheet 2 of 3)

p. APPLY A LIGHT COAT OF PWA 550 ANTI–GALLING COMPOUND ON BOLTS (19) AND NUT (20). REMOVE EXCESS.

q. ATTACH ANTI–ICING CONE (OUTER) (23) ON FAN INLET CASE.

r. INSTALL BOLTS (19) AND TORQUE IN SEQUENCE, 27 TO 30 LB–IN.

s. INSTALL PN 4064164 KEY WASHER (21) AND NUT (20).

t. USING PWA 57609 ADAPTER (22), TORQUE NUT (20) TO 150 TO 170 LB–IN.

u. IF NECESSARY, APPLY ADDITIONAL TORQUE TO ALIGN KEY WASHER TAB WITH SLOT IN NUT (20).

v. BEND TAB ON KEY WASHER (21).

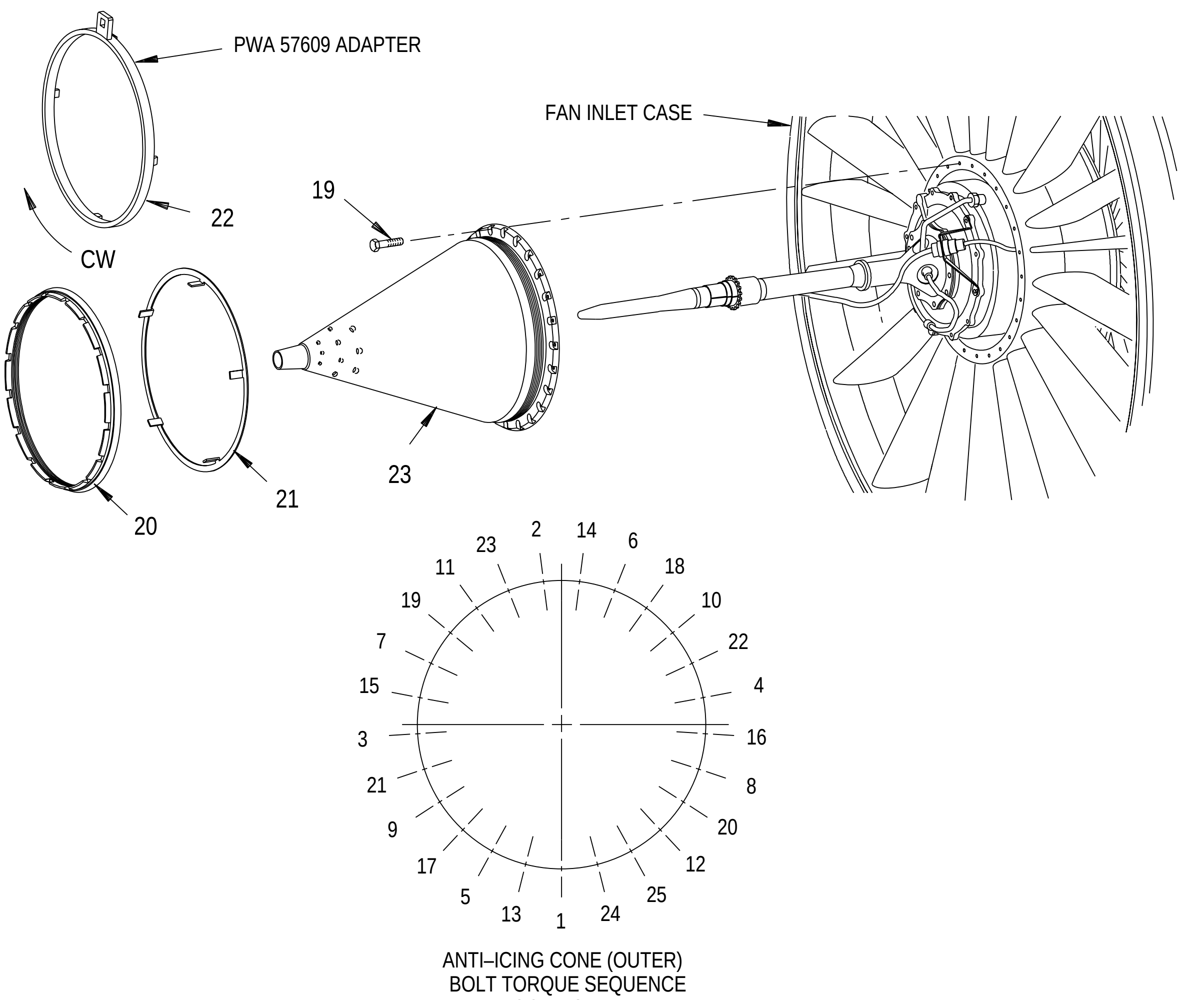


Figure 5. Quad N1 Electrical Sensor - Installation (Sheet 3 of 3)

Pages 13 through 16 deleted.

WORK PACKAGE

TECHNICAL PROCEDURES

PROBE - Ps2 ASSEMBLY

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 40

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	30	17 - 18	11	26	2
2 - 5	11	19 - 20	22	27 - 28	11
6	30	21	11	28A - 28D Added	11
7 - 15	2	22	2	29	11
16	11	23	11	30	30
16A Added	11	24	2	31 - 32	11
16B Blank Added	11	25	0	33 - 34 Added	11

REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information	T.O. 2J-F100-53-1
General Procedures	WP 021 00
General Cleaning Procedures - Cleaning Steel, Magnesium or Titanium Parts, Paint and Varnish Removal	SWP 031 14
General Repair Procedures - Masking Procedures	SWP 092 12
General Repair Procedures - Compound, Antigalling (PWA 550) Application	SWP 098 03
Qualified Repair Source List (QRSL) NonmodularParts	WP 601 00
Fluorescent Penetrant Inspection	T.O. 2J-F100-9
Standard Maintenance Procedures	T.O. 2-1-111

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Adhesive	Rosemount C00535-0001
Adhesive, sealant primer (PWA 556)	DC 1200
Adhesive, sealant primer (RTV rubber)	DC 3120
Alkali cleaner, carbon remover (PS 343) or Cleaner, degreasing	Blue Gold Industrial Cleaner Mirachem 100
Alcohol, denatured or Trichloroethane inhibitor-1,1,1	O-E-760, Type III O-T-620
Braze, silver	Rosemount C00628-0004
Catalyst	Dow Corning Type "S"
Cloth, abrasive, crocus	P-C-458
Cloth, dry lint-free	-
Compound, antigalling (PWA 550)	Hi-T-650 or Lubri-Bond HT
Flux, low-temperature silver brazing	AMS 3410
Lockwire (0.025 inch diameter)	MS9226-03
Shim, acetate	L-P-504 or 1020-1-
Tape, plater’s	No. 471

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Key washer	4061880	1
Key washer	4064164	1
Packing, preformed	AS3209-009	2

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
2	Ps2 Probe Assembly - Removal	
	Adapter, Anti-icing cone retaining nut	PWA 57609
	Spreader, spacer, Ps2 probe	PWA 57430
	Holder, Ps2 probe	PWA 61693
	Wrench, Ps2 probe	PWA 61694
4	Ps2 Probe Assembly - Inspection	
	Ohmmeter - Simpson Model 260 (or equivalent)	NSN 6625-00-867-2251
6A	Ps2 Probe Tube Assembly - Silicone Rubber Replacement	
	Fixture, Mold Injection	PWA 70401
6B	Ps2 Probe Tube Assembly - Sealing	
	Ohmmeter - Simpson Model 260 (or equivalent)	NSN 6625-00-867-2251
7	Ps2 Probe Tube Assembly - Installation	
	Adapter, Anti-ice cone retaining nut	PWA 57609
	Holder, Ps2 probe	PWA 61693
	Wrench, Ps2 probe	PWA 61694
	Spreader, spacer, Ps2 probe	PWA 57430

ILLUSTRATED SUPPORT EQUIPMENT

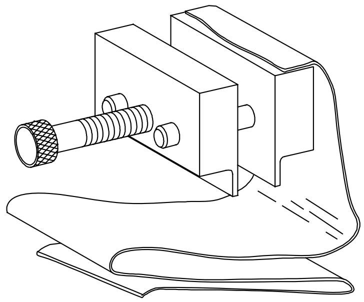


Figure T1. PWA 57430 Spreader

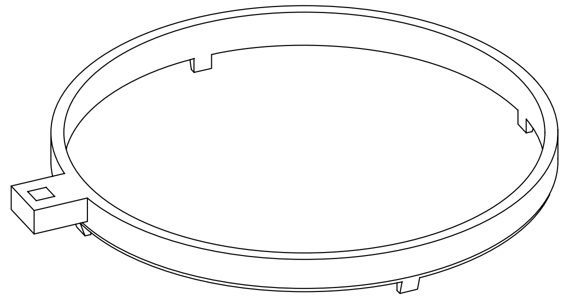


Figure T2. PWA 57609 Adapter

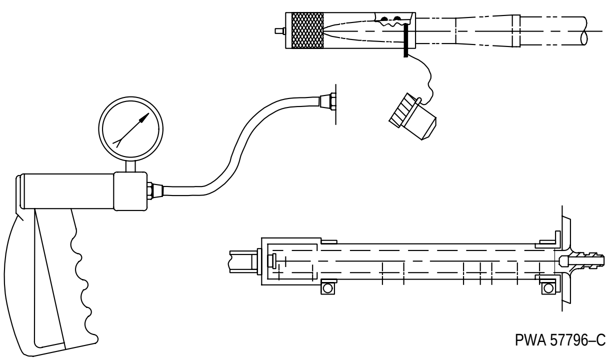


Figure T3. PWA 57796 Vacuum Tester Set

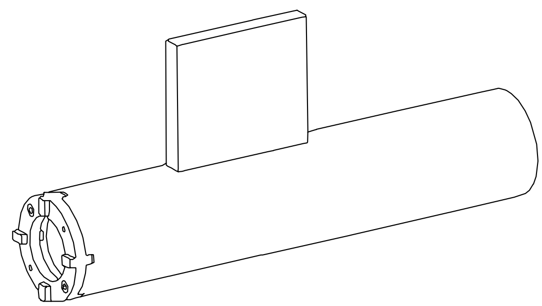


Figure T4. PWA 61693 Holder

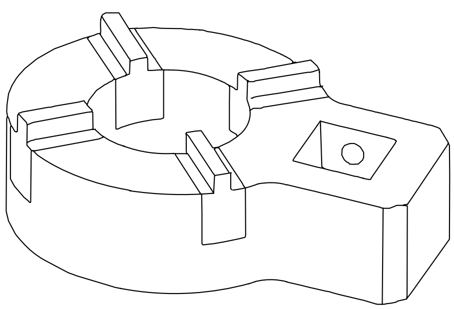


Figure T5. PWA 61694 Wrench

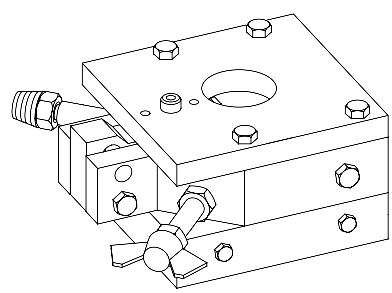


Figure T6. PWA 70401 Fixture

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures on the Ps2 probe assembly:

- Removal
- Cleaning
- Inspection
- Repair
- Sealing
- Installation

2. Ps2 PROBE ASSEMBLY - REMOVAL.

(See Figures 1 and 2.)

WARNING

Allow adequate cooling time before working near or handling Ps2 probe assembly. Accidental contact with hot probe may cause severe burn or other injury.

a. Remove Ps2 probe assembly(1) as follows:

(1) Straighten tabs on outer anti-icing cone key washer(2).

(2) Using PWA 57609 adapter(3), remove nut(4).

(3) Remove and discard key washer(2).

(4) Remove bolts(5) securing outer anti-icing cone(6).

(5) Remove cone.

(6) Disconnect Ps2 probe electrical connector(7) from receptacle(8).

NOTE

Ps2 probe fits tightly in inner anti-icing cone assembly. Probe does not thread into cone.

(7) Remove probe assembly(1) and tube(10) from inner anti-icing cone assembly(9) as a unit by pulling probe straight-forward from inner cone.

(8) Remove and discard packings(11) from aft end of probe.

CAUTION

Spacer is easily chipped or broken. Be careful when removing and replacing spacer.

NOTE

- Spacer should not be removed unless probe assembly is to be replaced.
- Ps2 probe assembly must be moisture sealed per paragraph 6B before installation if probe electrical cable part number is ESD 46199 (marked on probe electrical connector(7)).

(9) If replacing probe assembly, remove spacer(12) from probe assembly per step b.

(10) Straighten tabs on probe key washer(13).

(11) Using PWA 61693 holder and PWA 61694 wrench, unthread probe assembly from tube(10). Remove and discard key washer.

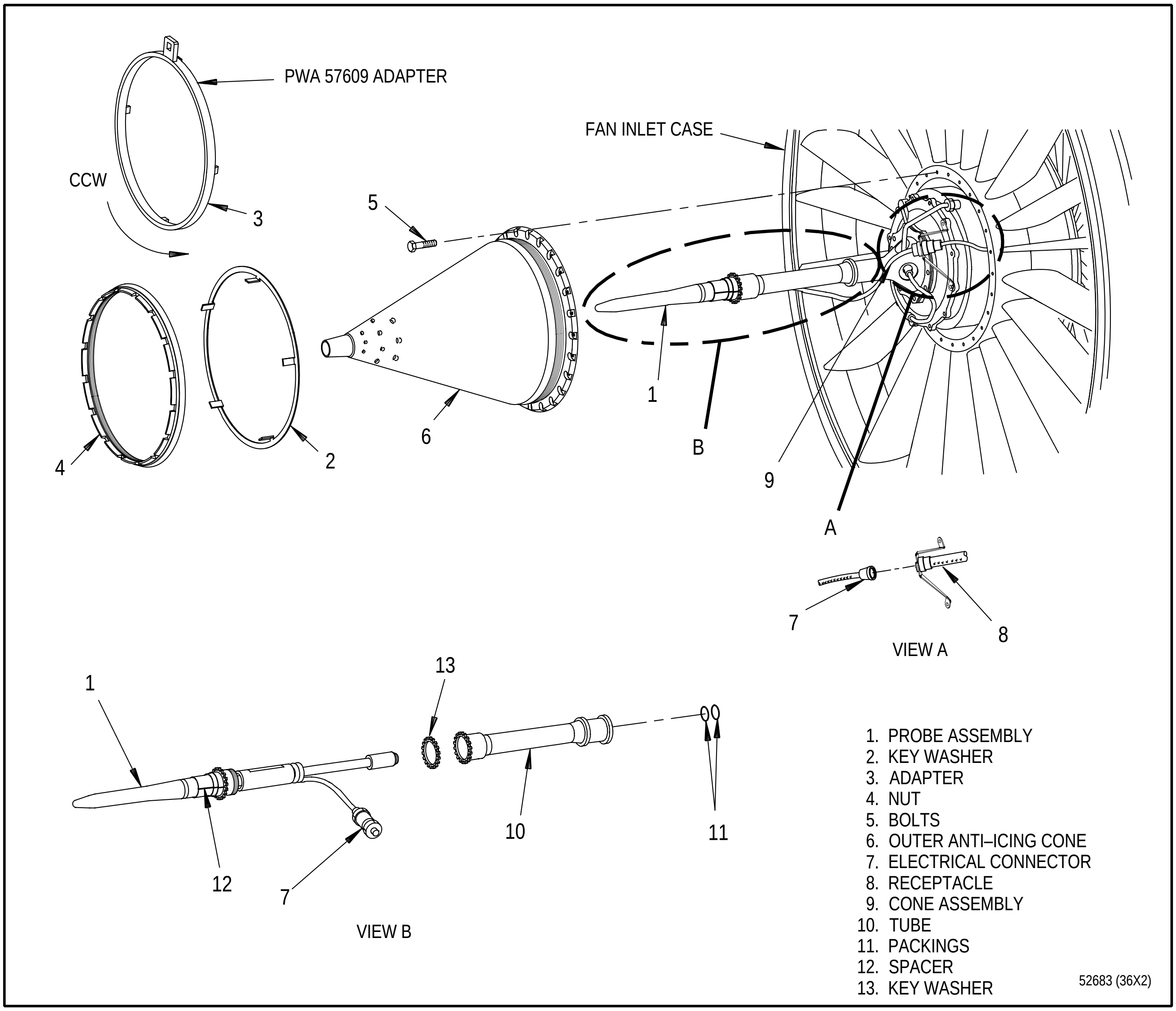


Figure 1. Ps2 Probe Assembly - Removal

b. If required, remove Ps2 probe per figure 2 and as follows:

(1) Place PWA 57430 spreader jaws(2) into spacer slot(3).

(2) Adjust thumb screw(4) to obtain a slightly snug fit between jaws and spacer.

(3) Wrap Velcro fastener(1) tightly around spacer and spreader.

(4) Turn thumb screw(4) to spread spacer enough to remove spacer from Ps2 probe. Remove spacer with spreader attached.

NOTE

It may be necessary to squeeze spreader jaws to overcome friction of shoulder screws.

(5) Back off thumb scew(4) and remove spreader from spacer.

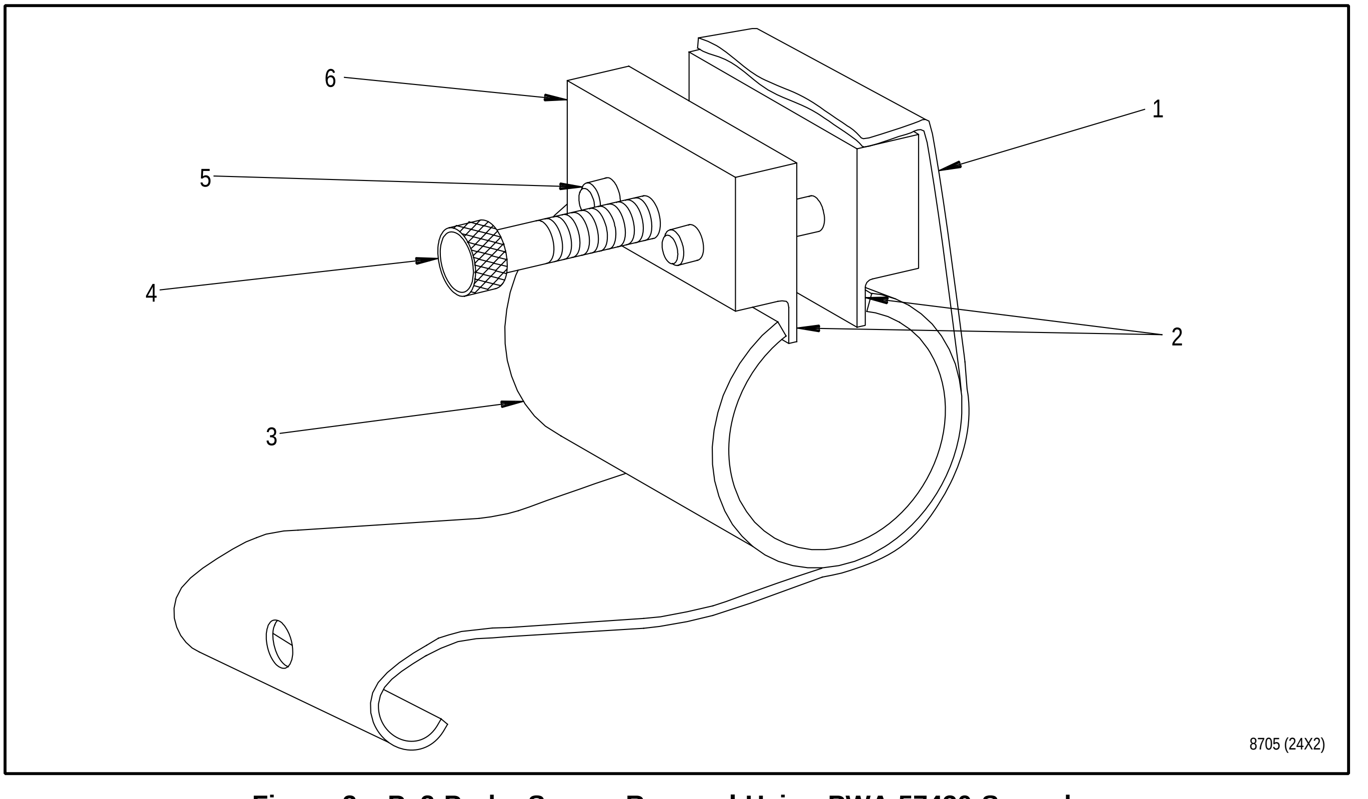


Figure 2. Ps2 Probe Spacer Removal Using PWA 57430 Spreader

3. Ps2 PROBE ASSEMBLY - CLEANING.

(See Figure 3.)

CAUTION

- Do not wash or scour aerodynamic contour with an abrasive substance. Such cleaning will destroy probe accuracy.
- Do not allow cleaning liquid or water to contact terminal connector or cable.

a. Clean aerodynamic contour by removing foreign material from external surfaces by washing with clean water and a soft cloth. If necessary to remove oil or grease, wipe external surface with a soft cloth dampened with PS 343 alkali cleaner. Refer to T.O. 2-1-111. See figure 3.

b. Clean static ports(2) as follows:

(1) Remove foreign material lodged in static ports by directing no more than 40 psi air into air fitting(11).

(2) If forced air fails to remove foreign material, soak or flush probe with clean water. Drain probe and repeat step (1).

CAUTION

Do not insert a metal rod, wire, or abrasive compound into static ports. Such cleaning can alter static port edges and cause irreparable damage.

(3) If steps (1) and (2) do not remove foreign material, use a thin, soft rod to dislodge foreign material. Use extreme care to avoid damaging static port edges.

c. Clean pressure line(10) and air fitting(11) as follows:

(1) Use crocus cloth to remove foreign material from air fitting and pressure line.

CAUTION

Ensure that water or alkali cleaner does not get into terminal can or on cable. Alkali cleaner or water can corrode cable.

(2) Remove oil and grease from air fitting by wiping with a cloth dampened with PS 343 alkali cleaner. Refer to T.O. 2-1-111.

(3) Rinse area to be cleaned with warm water.

(4) Dry the air fitting using no more than 40 psi air pressure.

(0) Dry exterior with a soft cloth and dry interior using no more than 40 psi air pressure.

4. Ps2 PROBE ASSEMBLY - INSPECTION.
(See figure 3, and Figures
4 through 7.)

a. Inspect Ps2 probe assembly per figure 3.

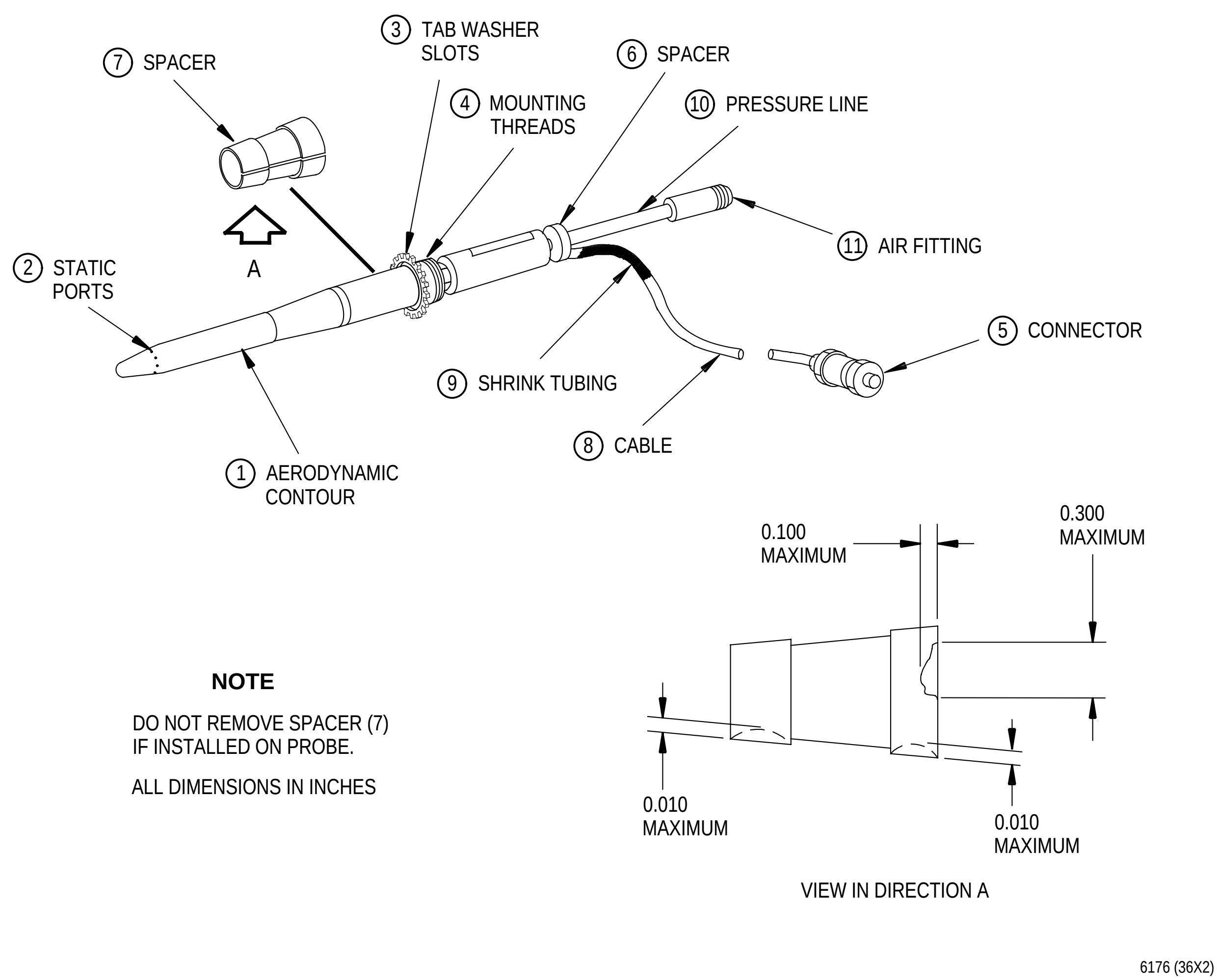


Figure 3. Ps2 Probe Assembly - Cleaning and Inspection

Legend for figure 3

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Aerodynamic contour -			
Cracked, bent	Not serviceable	Not reparable	Replace probe.
Nicked, scratched	No nicks or scratches within 0.500 inch forward of, and 0.250 inch aft of static ports. Nicks and scratches 0.500 inch forward of static ports to probe tip are limited to a 0.005 inch depth.Nicks and scratches 0.250 inch aft of static ports to spacer are limited to a 0.030 inch depth.	Not reparable	Replace probe.
Adhering foreign material	Not serviceable	See corrective action.	Clean aerodynamic contour per paragraph 3.

Legend for figure 3 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	MaximumReparable Limits	Corrective Action
2. Static ports -			
Clogged	Not serviceable	See corrective action.	Clean static ports per paragraph 3.
Flared, raised, rounded edges (See figure 3.)	Not serviceable	Not reparable	Replace probe.
3. Tab washer slots -			
Damaged tabs	Up to five tabs damaged, provided washer outer diameter is no more than 1.205 inches, and slot width is no less than 0.120 inch. (See figure 5.)	See corrective action.	Repair tabs per paragraph 6.
4. Mounting threads -			
Adhering foreign material, damaged threads	Not serviceable	See corrective action.	Clean and repair threads per paragraph 6.

Legend for figure 3 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
5. Electrical connector -			
Cracked, missing connector pins	Not serviceable	See corrective action.	Replace unserviceable probe. Return unserviceable probe to vendor for repair.
Bent connector pins	Not serviceable	See corrective action.	Straighten slightly bent pins. Refer to T.O. 2J-F100-53-1, WP 021 00.
Threads stripped, crossed, missing	Not serviceable	See corrective action.	Replace unserviceable probe. Return unserviceable probe to vendor for repair.
Connector insulation (insert) nicked, gouged, areas missing	Minor nicks acceptable	See corrective action.	Replace unserviceable probe. Return unserviceable probe to vendor for repair.
Connector backshell nicked or dented	Any amount without cracks or major backshell deformation.	See corrective action.	Replace unserviceable probe and return unserviceable probe to vendor for repair.

Legend for figure 3 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
6. Spacer -			
Cracked	Not serviceable	See corrective action.	Replace spacer per paragraph 6.
Chipped	Less than 0.150 inch long and wide	See corrective action.	Replace spacer per paragraph 6.
Adhesive	Chips less than 0.150 inch wide. Spacer must be secured to pressure line.	See corrective action.	Repair per paragraph 6.
Gouged	Gouges no more than 0.060 inch wide or 0.040 inch deep. If bottom of gouge cannot be seen, damage is considered a crack.	See corrective action.	Replace spacer per paragraph 6.

Legend for figure 3 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
7. Spacer -			
Cracked	Not serviceable	Not reparable	Replace spacer.
Chipped	0.300 inch wide 0.100 inch deep	Not reparable	Replace spacer.
Worn	0.010 inch deep	Not reparable	Replace spacer.
8. Cable -			
Metal overbraid corroded, broken, frayed, or worn	Discoloration acceptable. No more than 10 broken wires per 0.500 inch cable length	See corrective action.	Replace probe. Return unserviceable probe to vendor for repair.
9. Shrink tubing -			
Cut and torn	Less than 0.250 inch long. Scuff marks and nonpenetrating scratches permitted.	See corrective action.	Replace probe. Return unserviceable probe to vendor for repair.
Material missing	Less than 0.250 inch long and one-half circumference at tubing ends. No material missing from tubing center. Tubing at least 1.400 inches long	See corrective action.	Replace probe. Return unserviceable probe to vendor for repair.

Legend for figure 3 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
10. Pressure line -			
Dented	No more than two dents, each no more than 0.100 inch deep.	Not reparable	Replace probe.
Crooked	Ps2 probe tube can be threaded to probe by hand .	See corrective action.	Straighten pressure line per paragraph 6.
Cracked	Not serviceable	Not reparable	Replace probe.
11. Air fitting -			
Adhering foreign material	Not serviceable	See corrective action.	Clean air fitting per paragraph 3. Do not exceed dimensional tolerances. (See figure 6.)
Cracked or voided braze	Not serviceable	See corrective action.	Repair per paragraph 6.
Raised metal or sharp edges	No sharp edges or raised metal with outer diameter of 0.322 inch minimum.	See corrective action.	Remove raised metal and sharp edges by sanding with abrasive paper or crocus cloth. Do not exceed dimensional tolerances. (See figure 6.)

Legend for figure 3 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
11. Air Fitting - (continued)			
Nicked, dented	No more than 2 nicks or dents, 0.050 maximum dimension.	See corrective action.	Replace air fitting per paragraph 6.
Scratched	No more than 3 scratches, 0.010 inch deep, maximum, on outer surface. No scratches permitted on bottom or sides of grooves.	See corrective action.	Replace air fitting per paragraph 6.

b. Perform heater and resistance temperature device (RTD) insulation resistance test as follows:

(1) Ensure Ps2 probe and cable are clean and dry. Refer to paragraph 3.

(2) Heat probe in an oven at 300°F (149°C) at least 3 hours.

(3) Let probe cool to room temperature (60° to 100°F) (16° to 38°C) before starting test.

CAUTION

This test requires a 5 volt maximum output applied to resistance temperature device (RTD) circuit.

(4) Attach one ohmmeter lead to connector pin A or B and the other lead to the probe body. (See figure 7.) The ohmeter reading should indicate an insulation resistance 1 megohm or greater.

(5) Attach one lead of ohmeter to connector pin C or D and the other lead to the probe body. (See Figure 7.) The ohmeter reading should indicate an insulation resistance 1 megohm or greater.

(6) Attach one lead of ohmeter to connector pin A or B and the other lead to connector pin C or D. The ohmeter reading should indicate an insulation resistance 1 megohm or greater.

(a) If resistances determined in steps (5) and (6) are greater than 1 megohm, proceed to step (9).

(7) If insulation resistance is less than 1 megohm, do the following:

(a) Inspect probe for broken armor braiding wires, broken conductive wires that may cause a short circuit between probe body and ground, moisture and cleanliness. Also check ohmmeter lead connections.

(b) Repeat steps (1) through (6).

(8) If resistance remains less than 1 megohm, do the following:

(a) Cut off probe cable approximately 1.000 inch from terminal connector.

(b) Trim wire ends to expose conductors.

(c) Determine which pair of conductors has a resistance of 20 to 50 ohms and mark that pair. The other pair of conductors will have a resistance of 85 to 130 ohms.

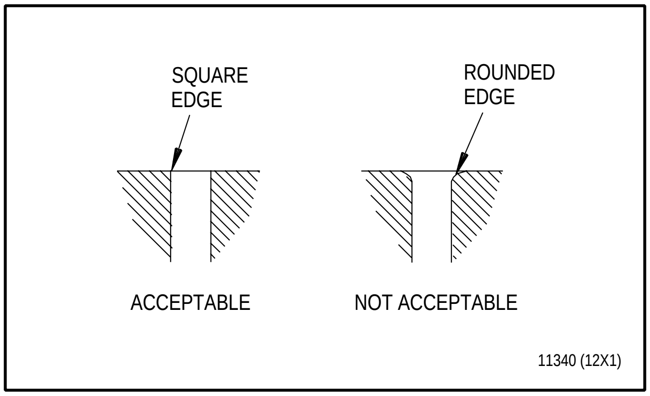


Figure 4. Static Ports - Inspection (Using 10X Glass)

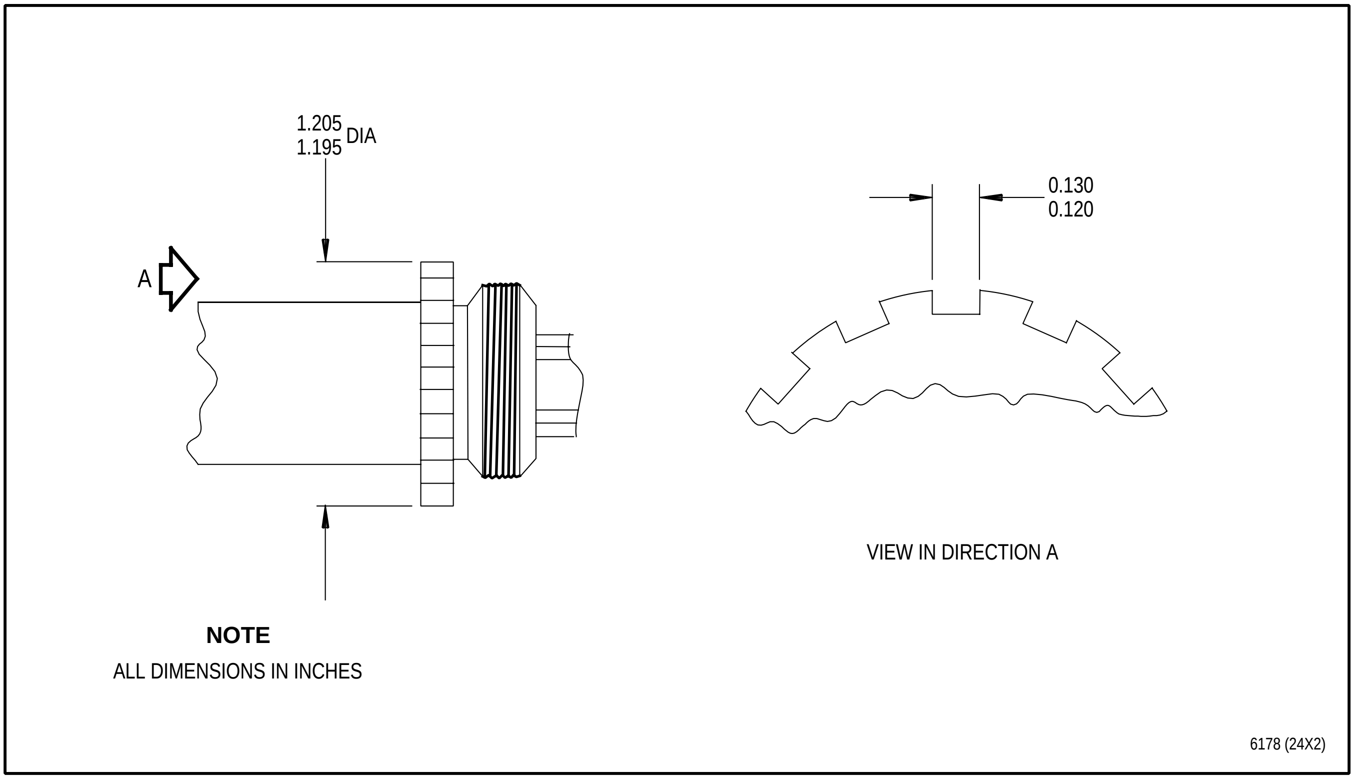


Figure 5. Tab Washer - Inspection

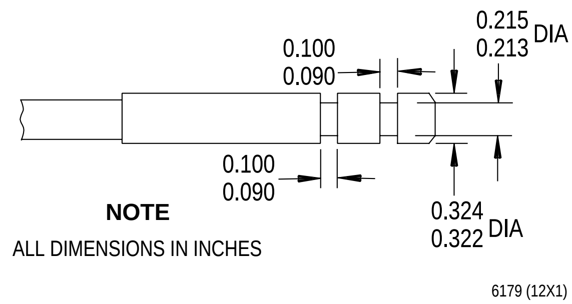


Figure 6. Air Fitting - Inspection

(d) Repeat steps (1) through (6), substituting one of the marked conductors for connector pin A or B.

(e) If insulation resistance is now 1 megohm or greater, replace probe. Return damaged probe to vendor for cable replacement. (See paragraph 6.)

(f) If insulation resistance is still below 1 megohm, discard the probe.

(9) Slowly lower probe, nose down, into a container of water until mounting threads are submerged. Ensure terminal can or cable remain dry. Do not touch either with wet hands.

(10) If terminal can or cable becomes wet, repeat steps (2) and (8).

(11) Allow probe to remain in water 3 minutes.

(12) Remove probe from water and perform steps (3) and (4).

(13) If insulation resistance is 1 megohm or greater, return probe to service.

(14) If insulation resistance is less than 1 megohm, discard probe.

c. Perform heater element resistance test as follows:

(1) Ensure probe is at room temperature (60° to 100°F) before starting test.

(2) Attach one lead of ohmmeter to connector pin A and the other lead to connector pin B. (See figure 7.) Ohmmeter reading should indicate a heater element resistance of 20 to 50 ohms.

(3) If element resistance is outside required range, ensure ohmmeter reading is not faulty due to such things as dirty connector pins, poor ohmmeter connections, or incorrect temperature. Repeat steps (1) and (2).

(4) If element resistance is still outside required range, proceed as follows:

(a) Cut probe cable off approximately 1.000 inch aft of terminal can.

(b) Trim wire ends to expose conductors.

(c) Determine which pair of conductors has a resistance of 20 to 50 ohms and mark them. (The other pair of conductors will have a resistance of 85 to 130 ohms).

(d) Repeat steps (1) and (2), substituting marked conductor pair for connector pins A and B.

(5) If heater element resistance is now within required range, replace probe. Return damaged probe to vendor for cable replacement. (See paragraph 6.)

(6) If heater element resistance is outside required range, probe shall be scrapped since heater is not reparable.

d. Perform resistance temperature device (RTD) temperature sensor test as follows:

(1) Prepare a water and ice slurry in a container at least 7 inches deep. Allow mixture to stabilize at 32°F (0°C).

(2) Lower Ps2 probe nose-first into the ice and water mixture to the level of mounting threads. Ensure that the terminal can and cable remain dry.

(3) Allow probe to soak in mixture a minimum of 3 minutes.

NOTE

This test requires an ohmmeter with a 5 volt maximum output.

(4) Attach one lead of ohmmeter to connector pin C and the other ohmmeter lead to connector pin D. (See figure 7.) Ohmmeter reading should indicate a temperature sensor resistance of 97 to 103 ohms.

(5) If temperature sensor resistance is outside required range, ensure ohmmeter reading is not faulty due to dirty connector pins, or poor ohmmeter connections. Repeat steps (1) through (4).

(6) If temperature sensor remains outside required range, proceed as follows:

(a) Cut off cable approximately 1.000 inch aft of terminal can.

(b) Trim wire ends to expose conductors.

(c) Determine which pair of conductors has a resistance of approximately 100 ohms and mark them. (The other pair will have a resistance of approximately 29 ohms.)

(d) Repeat steps (1) through (4), substituting the marked conductors for connector pins C and D.

(e) If temperature sensor resistance is within the required range, replace probe. Return damaged probe to vendor for cable replacement. (See paragraph 6.)

(f) If temperature sensor resistance is outside required range, probe shall be scrapped since temperature sensor is not reparable.

e. Perform probe pressure test as follows:

CAUTION

Failure to use specified tape may result in residue being left on the aerodynamic contour or in the static ports.

(1) Seal Ps2 probe static ports with PN 471 plater's tape (pressure tape) or equivalent.

(2) Connect a regulated air supply of at least 40 psi pressure to the probe's air fitting.

(3) Submerge probe fully (including air fitting) in container of clean water.

(4) Apply 40 psi maximum air pressure.

(5) Stabilize for 1 minute and check for air bubbles escaping from probe.

(6) If no air bubbles are found, remove probe from water, disconnect air supply, and proceed to step (9).

(7) If air bubbles are leaking from air fitting only, braze air fitting per paragraph 6 and repeat steps (1) through (6).

(8) If air bubbles are leaking from any part of probe, other than from air fitting, discard probe.

(9) Dry probe interior using 40 psi maximum air pressure.

(a) Remove plater's tape from probe and clean as required per paragraph 3.

(10) Heat probe in oven at 300°F (149°C) for a minimum of 3 hours.

(11) Return probe to service.

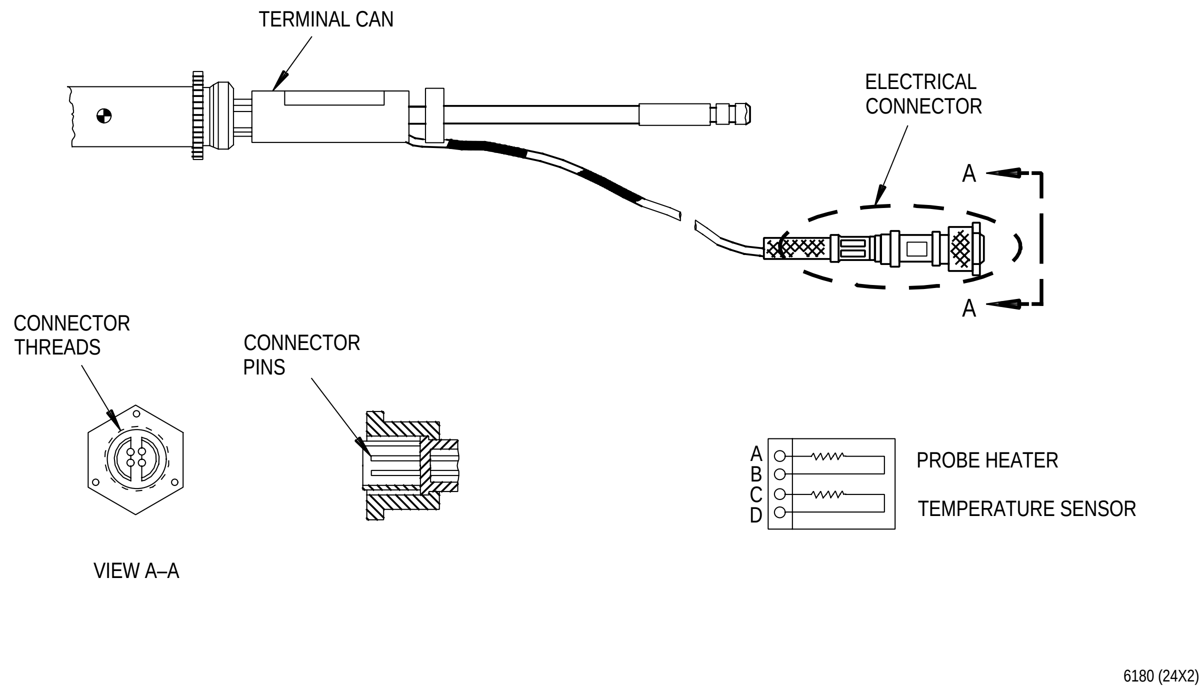


Figure 7. Ps2 Probe Heater and Temperature Sensor Electrical Connections

5. Ps2 PROBE TUBE ASSEMBLY - INSPECTION (See Figure 8.)

a. Visually inspect Ps2 probe tube assembly using white light and 3X magnifying lens per figure 8.

b. Inspect Ps2 TEST probe assembly with fluorescent penetrant. Refer to T.O. 2J-F100-9. No cracks allowed.

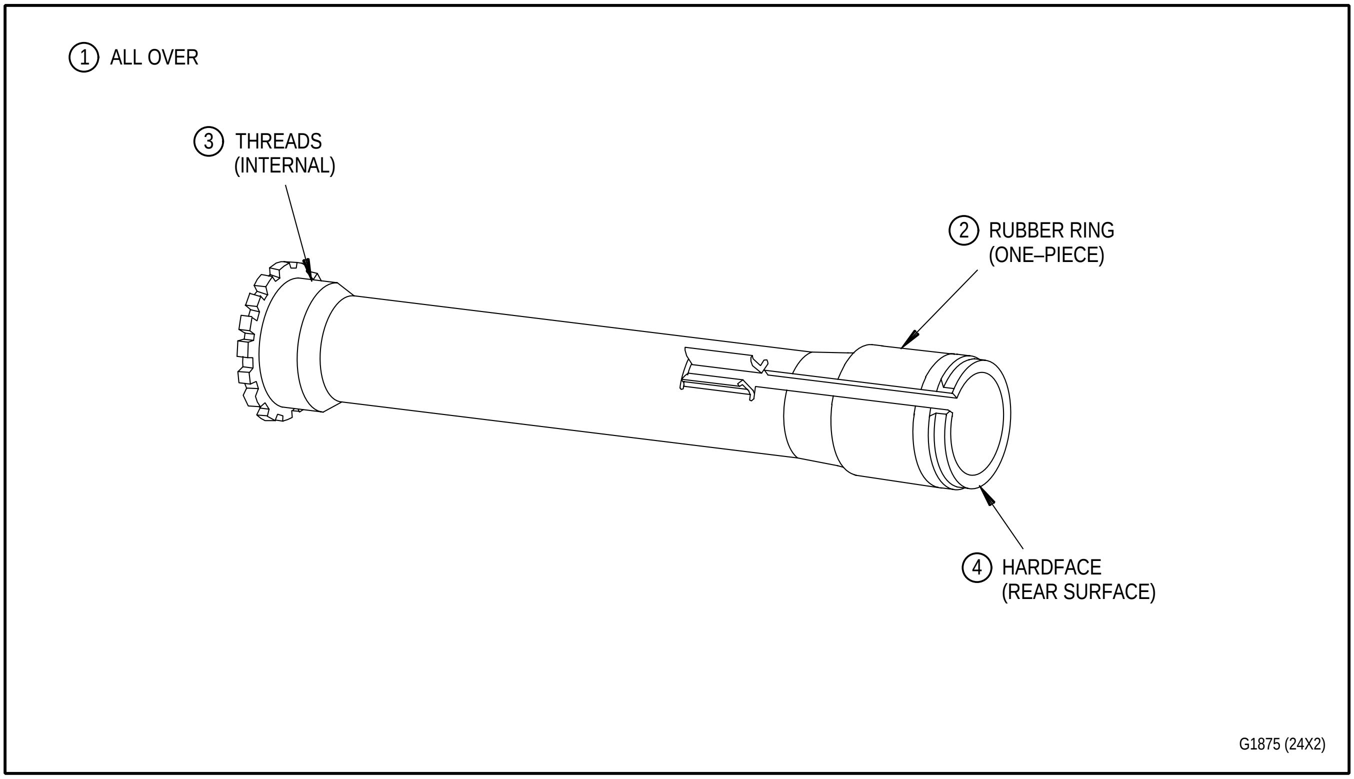


Figure 8. Ps2 Probe Tube Assembly - Inspection

Legend for figure 8

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. All over -			
Cracked	Not serviceable	Not reparable	Replace Ps2 probe tube assembly.
2. Rubber ring (one-piece) -			
Loose, shredded, torn, missing	One half width of band	Any amount	Repair per paragraph 6A.
3. Threads - (internal)			
Pitted, galled	0.010 inch depth	0.020 inch depth	Blend using crocus cloth, fine stones or files. Refer to T.O. 2-1-111. Remove minimum amount of parent material necessary for blend repair.
Raised metal, pickup	Not serviceable	0.200 inch above surface	Blend using crocus cloth, fine stones or files. Refer to T.O. 2-1-111. Remove minimum amount of parent material necessary for blend repair.
4. Hardface (rear surface) -			
Chipped, pitted	a. 0.030 inch diameter, maximum b. 0.250 inch separation, minimum	Not reparable	Replace Ps2 probe tube assembly per paragraph 7.

6. Ps2 PROBE ASSEMBLY - REPAIR.
(See figure 3 and Figure 9.)

CAUTION

Do not attempt to restore damaged tabs to their original size by adding weld or braze metal. These methods will severely damage probe.

a. Remove all raised metal on tab washer slots(3, figure 3) with a fine file or stone.

b. Mounting threads(4)

(1) Remove all oil, grease, and foreign material by wiping threads with a cloth or stiff nonmetallic bristle brush dampened with PMC 1284 alkali cleaner (PS 343). Ensure none of the cleaner gets into terminal can or on the cable.

(2) Rinse threads with warm or hot water, taking care that the terminal can and cable stay dry.

(3) Dry the mounting threads and adjacent area using 40 psi maximum air pressure.

(4) Using a fine file, stone or 20-thread-per-inch thread chaser, carefully dress off damaged areas of threads. Remove a minimum amount of material.

CAUTION

Do not force go-no-go gage on probe. Scrap probe if probe does not meet go-no-go thread requirement.

(5) Inspect repaired mounting threads for acceptability. Use a go-no-go 0.875-20 UNEF ring gage or Ps2 probe tube. Threads are acceptable if:

(a) Go-no-go gage or Ps2 probe tube threads freely on probe threads. If not, repeat steps (1) through (4).

(b) If threads will not enter go-no-go gage.

(c) If all threads enter go-no-go gage provided there is a definite drag from contact between gage and probe on or before third turn of gage.

c. Spacer adhesive(6)

(1) If spacer is not loose, proceed to step(2). If spacer is loose or has excessively large chips in the adhesive, use a razor blade or sharp knife to remove all cement from spacer and pressure line. Replace spacer per step d.

(2) Remove all oil and grease from the spacer and adjacent pressure line by wiping those areas with a cloth dampened with PMC 1284 alkali cleaner (PS 343). Ensure that none of the cleaner gets into terminal can or on the cable.

(3) Rinse area cleaned thoroughly with a clean cloth and warm water. Ensure terminal can and cable stay dry.

(4) Dry spacer and pressure line using 40 psi maximum air pressure.

(5) Position spacer within dimension shown in figure 10.

(6) Apply C00535-0001 adhesive to both sides of spacer with approximately a 1/8-inch radius fillet between spacer and pressure line. Ensure there are no voids in the adhesive.

d. Replacement of spacer(6) or air fitting(11).

(1) Remove preformed packing from grooves in air fitting.

(2) Remove all oil and grease from air fitting and pressure line by wiping those areas with a cloth dampened with PMC 1284 alkali cleaner (PS 343). Ensure that none of the cleaner gets into terminal can or on the cable.

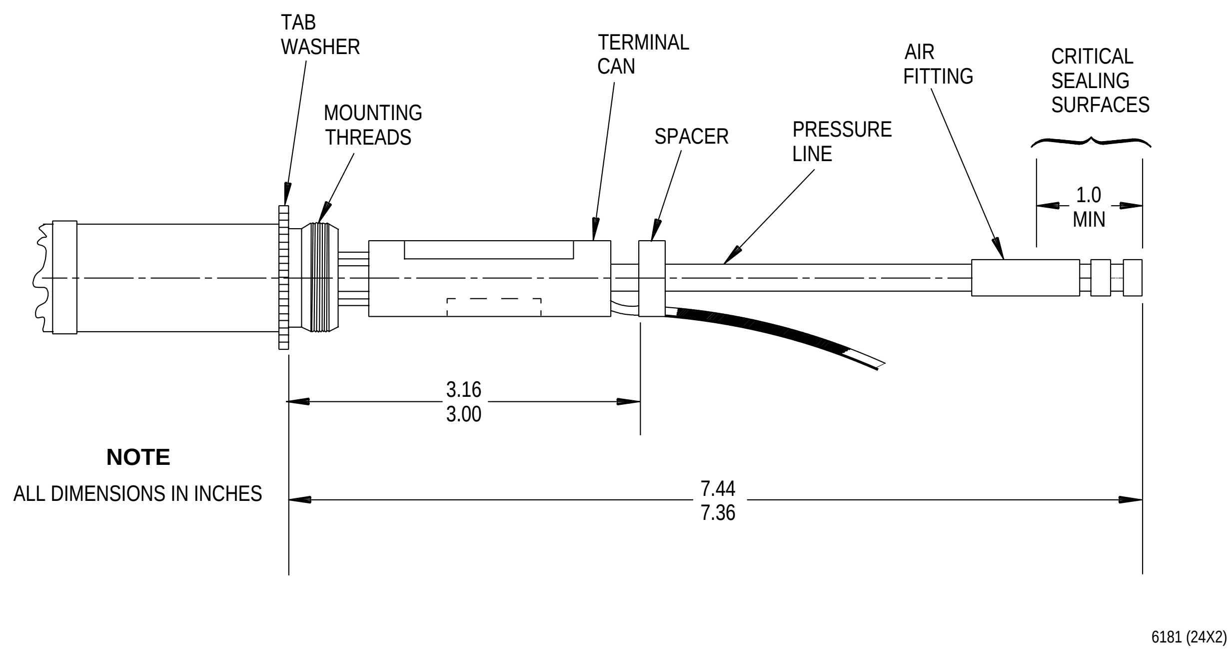


Figure 9. Spacer and Air Fitting - Repair

(3) Rinse area cleaned thoroughly with a clean cloth and warm water. Ensure that terminal can and cable stay dry.

(4) Dry spacer and pressure line using 40 psi maximum air pressure.

(5) Apply AMS 3410 silver brazing flux to air fitting and pressure line in area of braze joint.

(6) Heat air fitting uniformly until braze melts (approximately 1200°F (649°C).

CAUTION

Holding air fitting with pliers in vicinity of packing grooves or within 1.00 inch minimum length shown in figure 10 can damage sealing surfaces.

(7) Hold the air fitting with pliers and remove from pressure line.

(8) Deflux end of pressure line and air fitting by immersing fluxed area in clean hot water. Ensure not to immerse probe cable and terminal can.

(9) Dry air fitting and pressure line using 40 psi maximum air pressure.

(10) If the air fitting is to be reused, remove braze from air fitting interior by sanding with abrasive paper or reaming. Ensure required inner diameter is 0.253 to 0.261 inch.

(11) Remove braze from pressure line by sanding with abrasive paper or crocus cloth. Ensure required outer diameter is 0.245 to 0.253 inch.

(12) Remove cement used to attach spacer to pressure line with a razor blade or sharp knife.

(13) Remove spacer from pressure line and remove any remaining adhesive by chipping or sanding with abrasive paper or crocus cloth. Ensure required outer diameter of pressure line is 0.245 to 0.253 inch.

(14) Install new spacer onto pressure line and temporarily secure it as close to terminal can as possible.

(15) Apply a thin coating of braze flux to inner diameter of air fitting.

(16) Install air fitting onto pressure line and position to dimension shown in figure 9.

(17) Completely cover exterior of air fitting with braze flux.

(18) Torch braze air fitting to pressure line using C00628-0004 silver braze.

(19) Deflux end of pressure line and air fitting by immersing fluxed area in clean hot water. Ensure probe cable and terminal can stay dry.

(20) Pressure test probe as described in paragraph 4.e.. If leakage is found, repeat steps (17) through (19).

(21) Ensure pressure line is clean and dry, then position spacer to dimension shown in figure 9.

(22) Apply adhesive to both sides of spacer as an approximately 1/8-inch radius fillet between spacer and pressure line. Ensure that there are no voids in adhesive.

e. Straightening of pressure line(10, figure 3).

CAUTION

Do not attempt to straighten pressure line without a protection plastic sheath or damage to pressure line may result.

(1) Install a protective plastic sheath over pressure line.

CAUTION

Irreparable damage will result if probe housing or terminal can is held to straighten pressure line.

(2) Hold pressure line in appropriate areas with two pairs of pliers and straighten it.

(3) Remove protective sheath.

(4) Inspect pressure line in Views A and B, figure 1.

(5) Perform heater element resistance test, temperature sensor test, and probe pressure test per paragraph 4.

f. Cable or shrink tube repairs.

NOTE

Vendor repair procedure listed in the Qualified Repair Source List (QRSL) shall be kept current by incorporation of all T.O. changes that affect the repaired part. If procedure listed does not incorporate the T.O. changes, then vendor shall submit a procedure revision to Pratt & Whitney for review and update of the procedure and revision date in the QRSL.

(1) This is a proprietary repair. Proprietary repairs for the following distress modes may be performed only by qualified repair sources identified in the QRSL. Refer to T.O. 2J-F100-13-1, WP 601 00.

- QB2-20 Cable damage: braid chafing and broken wires, connector and backshell damage.
- QB2-24 Shrink tubing damage: cuts, tears, missing sections.

(2) The proprietary repair procedure shall include the following operations:

- Perform incoming inspections.
- Remove and replace cable, and or shrink tube.
- Perform final acceptance tests and inspections.

6A. Ps2 PROBE TUBE ASSEMBLY - SILICONE RUBBER REPLACEMENT.
(See Figure 9A.)

NOTE

- Two configurations exist for Ps2 probe tube rubber vibration damper. One configuration has a one-piece vibration damper, and the other has a two-ring vibration damper.
- Replacement procedure applies to both configurations. However, two-ring rubber damper will be replaced with one-ring rubber damper and the assembly will be re-identified to the new (one-ring) configuration part number.
- Semco-type pneumatic injection system is used to perform this task.

a. Mask rear surface of hardface (figure 9A). Refer to T.O. 2J-F100-53-1, SWP 092 12.

b. Remove silicon rubber. Refer to T.O. 2J-F100-53-1, SWP 092 12.

c. Strip antigallant. Refer to T.O. 2J-F100-53-1, SWP 031 14.

d. Clean with isopropyl alcohol.

e. Mix and mold DC 3120 RTV silicone rubber as follows: (Refer to figure 9A.)

(1) Apply PWA 556 primer to area to be molded with silicone rubber.

(2) Measure sufficient base material (100 grams per injection) using a clean container approximately four times the volume of the base material.

(3) Place container with base material in a vacuum at least 29 inches Hg for a minimum of 10 minutes.

(4) In a separate container, weigh the curing agent at a 10:1 base to curing agent ratio by weight.

(5) Stir curing agent with a tongue depressor until consistency is smooth. No lumps are allowed.

(6) Mix curing agent with base material until all visual streaks disappear (5 minutes minimum). Material clinging to the sides and bottom of the container should be folded into the main contents twice during the mixing process.

(7) Place container with mixed compound in a vacuum of at least 29 inches Hg for a minimum 5 minutes.

NOTE

During the final deaeration process, the compound may froth out of the container. If so, remove from vacuum to clean off frothing and return. If PWA 26443 Dispenser is used, pour contents of container into dispenser and proceed to step 11.

(8) Remove compound from vacuum and transfer into an 8 ounce Semco cartridge or equivalent. To complete the final deaeration process, install cartridge plug and return compound to a vacuum of at least 29 inches Hg for a minimum of 5 minutes.

(9) Inspect cartridge for complete deaeration process. If air is still present, repeat deaeration process of previous step. If compound is air free, go to next step.

(10) Position the piston in the Semco cartridge as follows: Place a 0.200 inch minimum diamter wire lengthwise in the cartridge filled with compound. While holding the wire, position the piston in the cartridge and push the piston until it contacts the compound. The wire will temporarily deform the piston, allowing excess air to escape from between the compound and the piston. When the piston contacts the compound, pull the wire out of the cartridge and discard the wire.

(11) Position the injection mold on its side so that the rubber injection port is pointing down and the air/ rubber evacuation port is pointing up.

(12) Inject the rubber compound into fixure.

(13) Let mold stand a minimum of 14 hours ambient above 60°F, confined.

(14) Place in an oven and heat to 100°F plus or minus 10°F for 8 to 8.5 hours.

(15) Allow to air cool and remove from fixture.

(16) Allow parts to stand a minimum of 3 days in ambient conditions above 60°F following removal from the fixture.

f. Reapply PWA 550 antigallant. Refer to T.O. 2J-F100-53-1, SWP 098 03. Omit the stripping procedure.

g. Reidentify PN 4068676 to PN 4076102. Refer to T.O. 2-1-111.

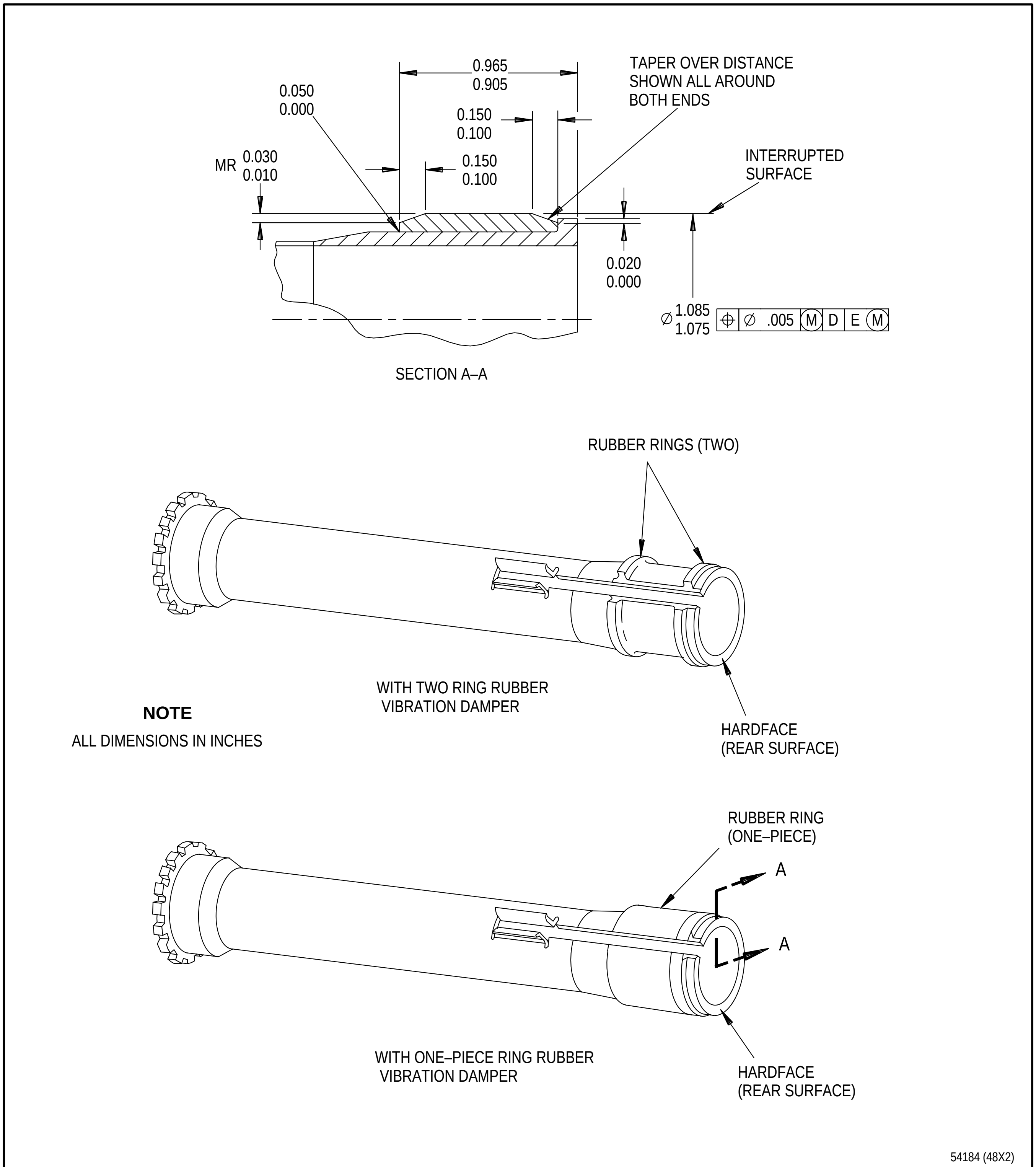


Figure 9A. Ps2 Probe Tube - Assembly

6B. Ps2 PROBE ASSEMBLY - SEALING.
(See Figure 9B.)

NOTE

This procedure is only effective when used on Ps2 probes PWA 4073980 which incorporate insulated electrical cables (Cable PN ESD 46199).

a. Verify Ps2 probe is PWA 4073980 with pigtail PN ESD 46199 (marked on electrical connector) Reference figure 9B.

b. Remove Ps2 probe support tube per figure 1 (Item 10).

c. Thoroughly clean and degrease areas to be RTV’d using PMC 1284 alkali cleaner (PS 343), O-E-760 Type III alcohol, or equivalent. Reference figure 9B.

d. Allow degreaser to dry.

CAUTION

Irreparable probe damage will occur if voltage across probe pins A and B and pins C and D exceeds 5 volts.

e. Using an ohmeter, measure the resistance between connector pins A and C, pin A and the probe body, and pin C and the probe body. If any reading is less than 1 megohm, bake the probe for 3 hours at 300°F. Allow probe to cool to room temperature.

f. Position the probe in a vertical position nose down. Using MS9226-03 safety wire, secure the cable to the probe with the connector pointing down. Reference figure 9B.

g. Apply Dow Corning 1200 Primer Coat or equivalent to the areas indicated in figure 9B. Allow solvent to dry.

NOTE

Inadequate mixing of the base and/or the catalyst will result in an improper cure or a tacky texture which can prolong the RTV cure.

h. Thoroughly stir the Dow Corning 3120 RTV and Dow Corning Type "S" catalyst prior to mixing. Catalyst can be mixed inside of tube using a cotton swab stick.

i. Mix 7 cc’s of the RTV base to 1 cc of the Type "S" catalyst by volume (ample supply to pot five probes). Mix thoroughly until color is uniform. Working time after mixing is 30 minutes.

j. Apply RTV, using a clean spatula or cotton swab stick, to the terminal can/cable interface. The potting should be applied to seal the terminal can edges (360 degrees) and the cable exit location. Reference figure 9B.

k. Apply potting to the electrical connector/cable interface as indicated in figure 9B. The RTV should seal the two cables as they enter the strain relief sock and also seal the strain relief sock where it is crimped at the connector backshell. Reference figure 9B.

l. Allow the probe to remain vertical and let stand for 24 hours at room temperature.

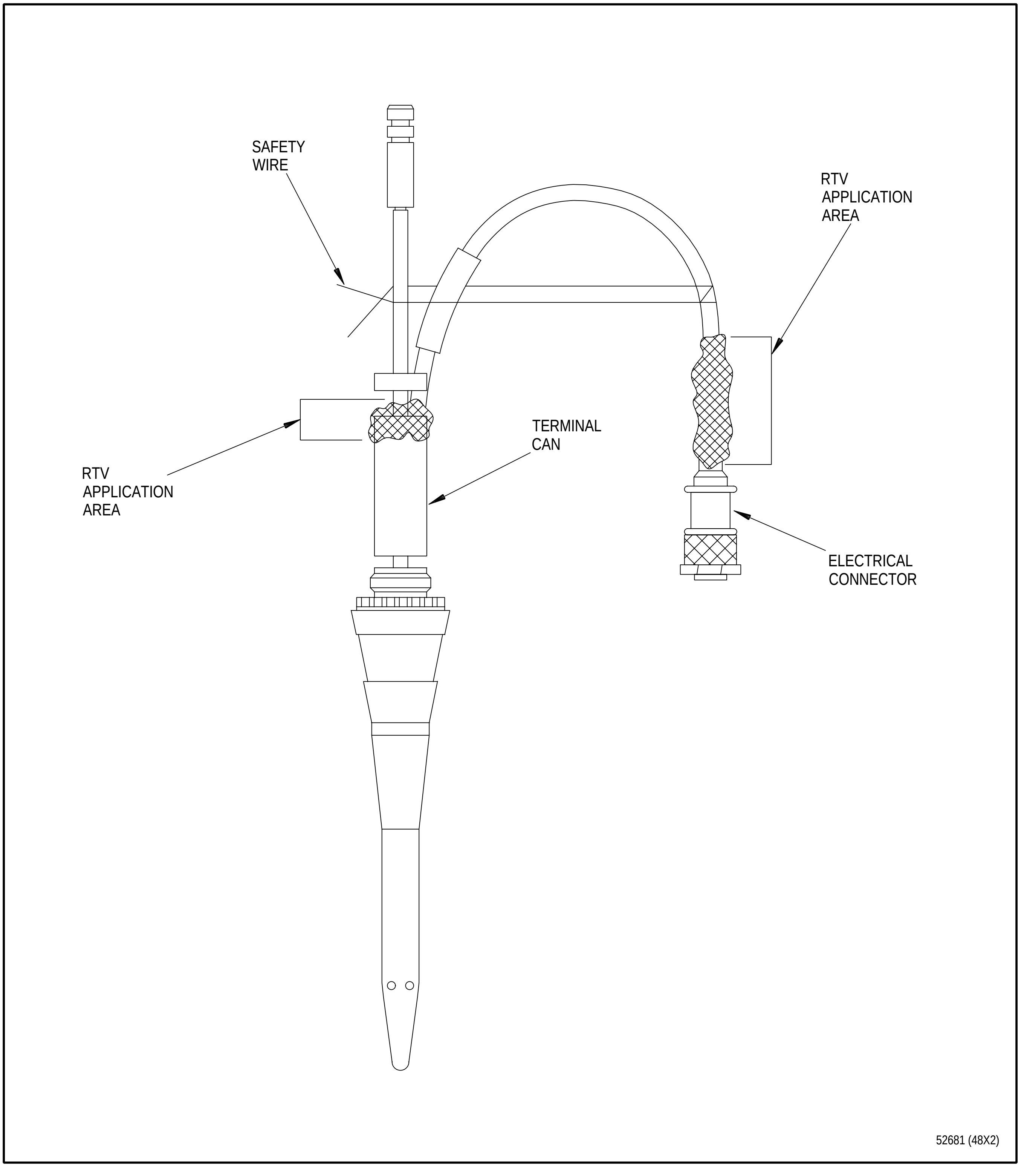


Figure 9B. Ps2 Probe - Sealing

7. Ps2 PROBE ASSEMBLY - INSTALLATION.
(See Figures 9C and 10.)

a. Ensure Ps2 probe (2, figure 10) has been moisture sealed per paragraph 6B if probe electrical cable part number is ESD 46199 (marked on probe electrical connector(3)).

a1. If Ps2 probe was disassembled, go to step b, otherwise, go to step h.

b. Pass electrical connector(3) through key washer(1) and tube(4).

b1. Install key washer on probe(2).

c. Thread tube(4) onto probe(2) fingertight.

d. Align tabs of keywasher(1) with slots in tube(4). Bend two opposite tabs approximately 180 degrees apart of key washer into slots on tube.

e. Using PWA 61693 holder and PWA 61694 wrench, torque probe to minimum of 8 to 12 lb-in.

f. If necessary, apply additional torque to align key washer tabs with slots in probe(2).

g. Bend remaining tabs of key washer(1) bending adjacent tabs in opposite direction

CAUTION

Failure to install Ps2 spacer(5) against probe tab washer slots(8A) may cause severe damage to Ps2 probe or engine.

NOTE

- Excess antigalling compound may be removed to facilitate installation of Ps2 spacer by wiping with clean cloth. Do not use abrasive material or expose underlying material.
- Ps2 spacer may not have been removed.

h. Install spacer(5), if required, per figure 9C as follows:

(1) Apply a light coat of PWA 550 antigalling compound to spacer inner surface. Remove excess.

(2) Place PWA 57430 spreader jaws(2) into slot in spacer(3).

(3) Adjust thumb screw(4) to obtain a slightly snug fit.

(4) Wrap velcro fastener(1) tightly around spacer(3).

(5) Turn thumb screw(4) to spread spacer(3) apart.

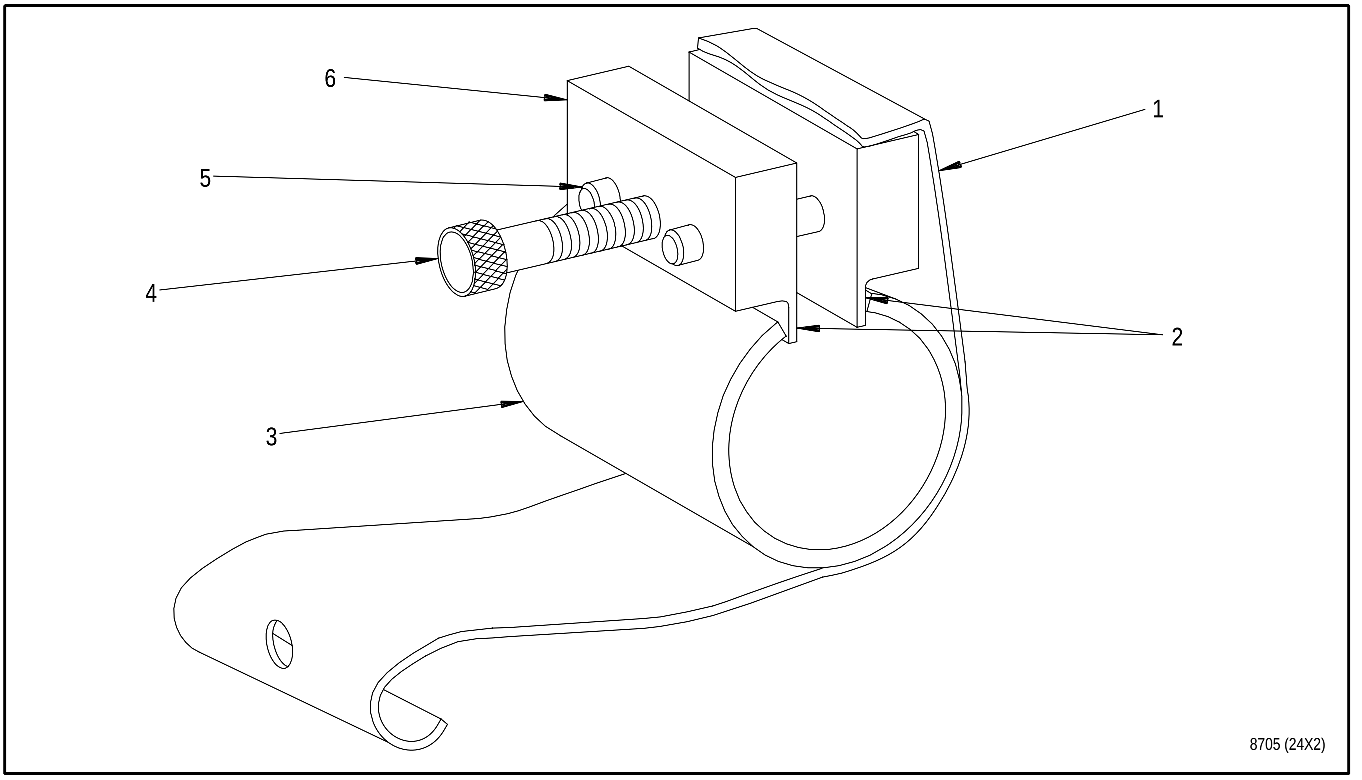
(6) Adjust spreader(6) so spacer(3) can be installed on Ps2 probe assembly.

NOTE

It may be necessary to squeeze jaws(2) of spreader together to overcome friction of shoulder screws(5).

(7) Install spacer(3) onto Ps2 probe assembly until spacer contacts probe tab washer slots(8A, figure 10).

(8) Backoff thumb screw(4, figure 9C) and remove spreader(6) from spacer(3).



1.	Velcro fastener	4.	Thumb screw
2.	Jaws	5.	Shoulder screws
3.	Spacer	6.	PWA 57430 spreader

Figure 9C. PWA 57430 Ps2 Probe Spacer Spreader

NOTE

Ps2 probe packings do not require lubrication.

i. Install packings(6, figure 10) in grooves of Ps2 probe(7).

j. Position electrical cable(3) into slot in Ps2 tube.

k. Align slot in Ps2 tube with tab in anti-icing cone (inner)(8). Insert Ps2 probe and tube assembly into anti-icing cone.

l. Perform Ps2 Plumbing Integrity Check as follows:

(1) Connect PWA 57796 Ps2 adapter to vacuum pump. Remove Ps2 adapter cap before using tool.

(2) Connect PWA 57796 DEEC Vacuum Tester to Ps2 probe.

CAUTION

- Do not apply pressure to Ps2 system. Damage may occur.
- Do not use liquids to check Ps2 system for leaks. DEEC transducer may be damaged.

(3) Evacuate Ps2 system, using hand vacuum pump until gage reads 8 to 16 inch HG.(4 to 8 PSIA). Monitor pump for 60 seconds. If leak is detected, look for Ps2 leaks in following areas and repeat this procedure until corrected:

(a) Preformed packings in PWA 57796 Ps2 adapter.

(b) External plumbing.

(c) Ps2 probe.

(d) Inlet fan case.

(4) Release pressure to Ps2 probe prior to removing vacuum pump.

(5) Remove vacuum pump from probe.

m. Connect Ps2 probe electrical connector(9) to receptacle(10).Torque coupling nut 120 to 130 lb-in. Lockwire with MS9226-03 wire.

n. Apply a light coat of PWA 550 anti-galling compound on bolts(11) and nut(12). Remove excess.

o. Attach anti-icing cone(outer)(13) on fan inlet case.

p. Install bolts(11) and torque 27 to 30 lb-in.in sequence as shown in Sheet 2.

q. Install PN 4064164 key washer(14) and nut(12).

r. Using PWA 57609 adapter(15), torque nut(12) to 150 to 170 pound-inches.

s. If necessary, apply additional torque to align key washer tab with slot in nut (12).

t. Bend tab on key washer(14).

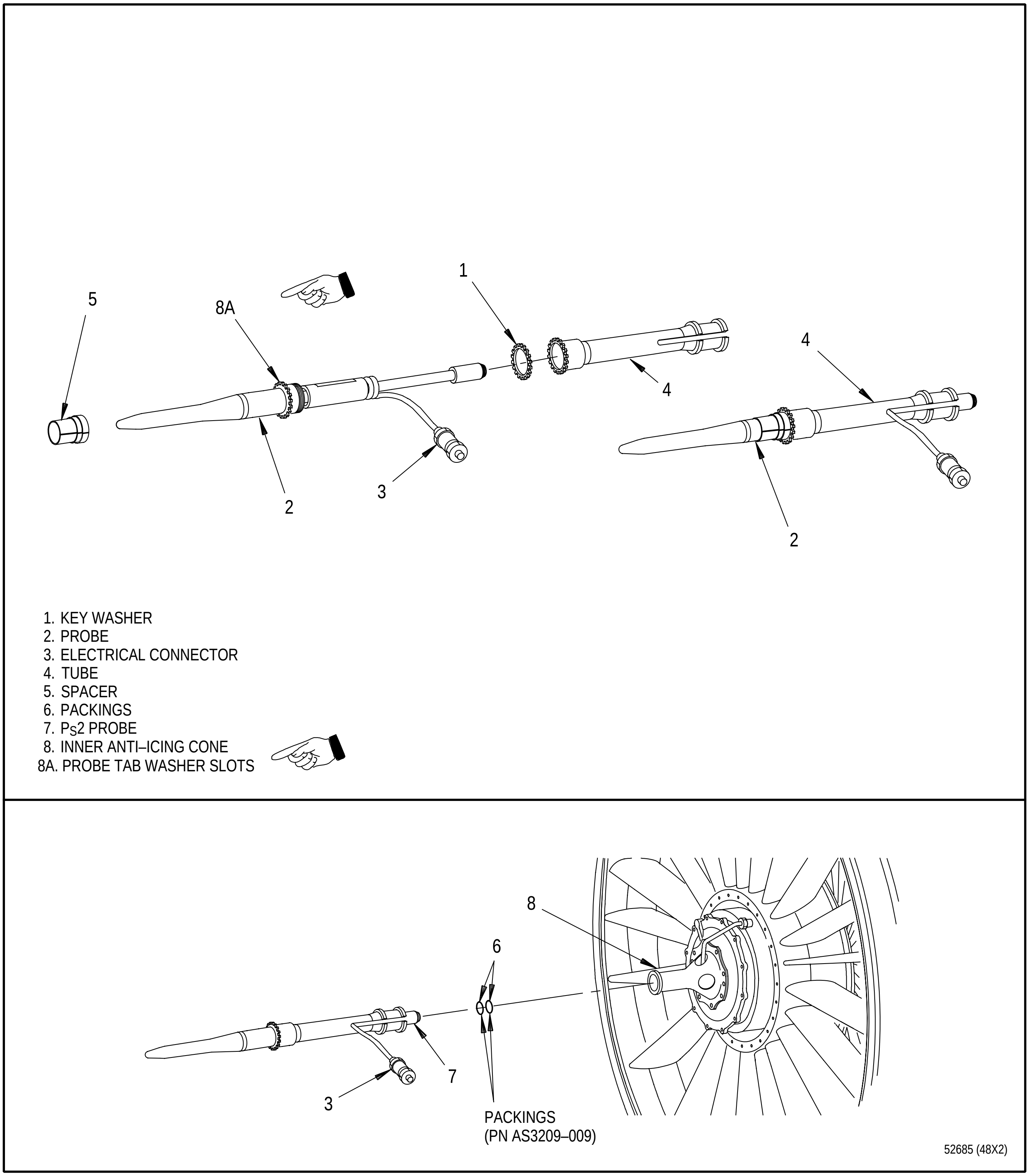


Figure 10. Ps2 Probe Assembly - Installation (Sheet 1 of 2)

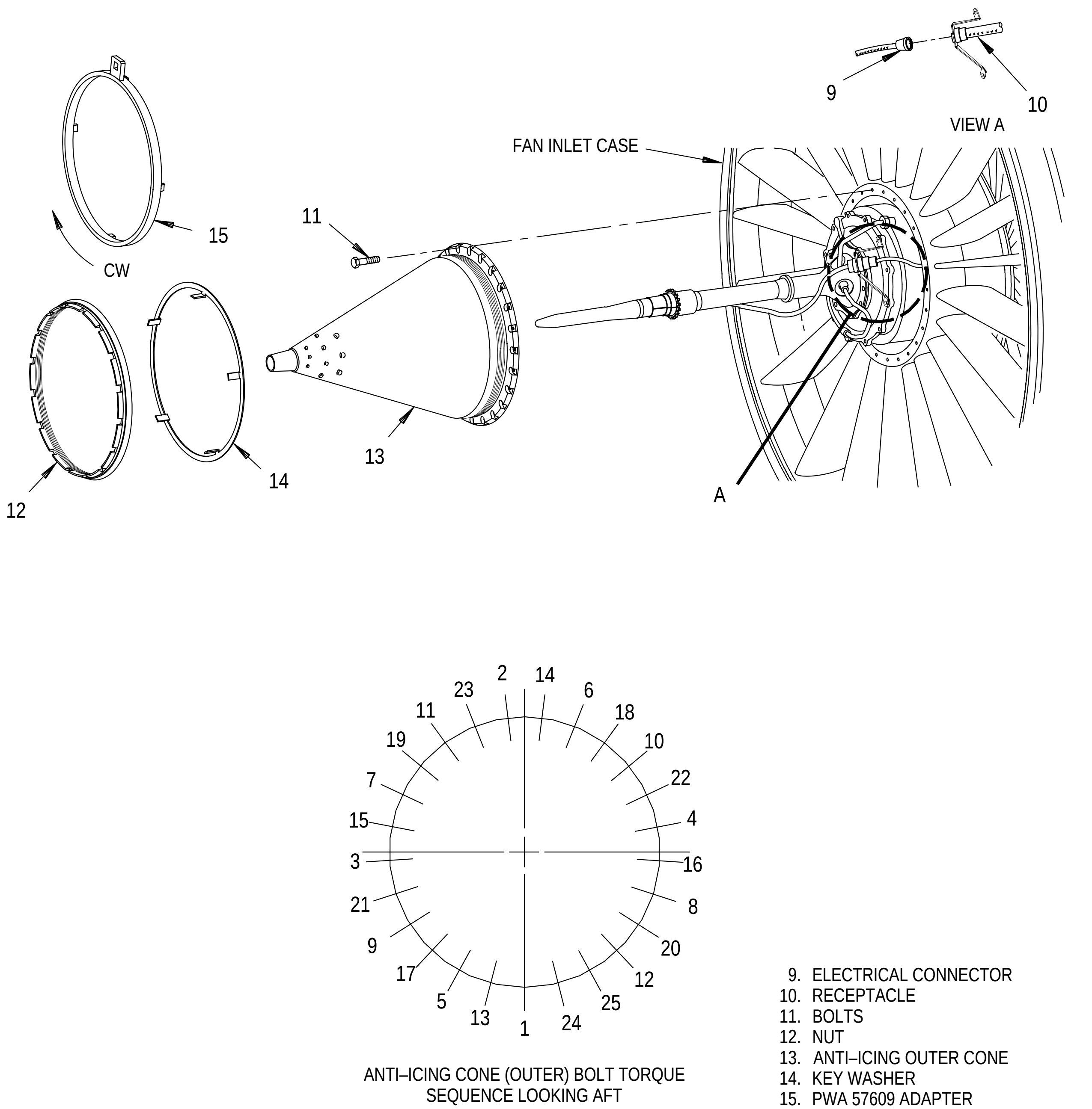


Figure 10. Ps2 Probe Assembly - Installation (Sheet 2 of 2)

WORK PACKAGE

TECHNICAL PROCEDURES

CONNECTOR, FRONT - TUBE, FUEL DRAIN MANIFOLD

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 10

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 9	0	10 Blank	0		

REFERENCE MATERIAL REQUIRED

None

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Barrier material, greaseproof, flexible	MIL-B-121, Type II, Grade A, Class I
Cloth, lint-free	-
Compound, antigalling, (PWA 550)	Hi-T-650 or Lubri-Bond HT
Oil, lubricating	MIL-L-7808
or	
Petrolatum	VV-P-236
Solvent, petroleum	P-D-680, Type II

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Packing, preformed	MS9966-04	3
Packing, preformed	MS9966-06	1

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. There are two fuel drain manifold tube connectors on the engine. One, a front tube connector, is mounted on the rear of the main fuel gear pump. The other, a rear tube connector, is located at 6 o’clock position aft of the augmentor fuel control.

b. This work package contains instructions for the following maintenance procedures on the front fuel drain manifold tube connector:

- Removal
- Removal of attaching parts
- Cleaning
- Inspection
- Installation of attaching parts
- Installation
- Storage and shipment

2. FRONT FUEL DRAIN MANIFOLD TUBE CONNECTOR - REMOVAL.
(See Figure 1.)

a. Disconnect tube and hoses from front fuel drain manifold tube connector per figure 1.

b. Remove bolts. Remove tube connector.

c. Drain residual fuel from tube connector.

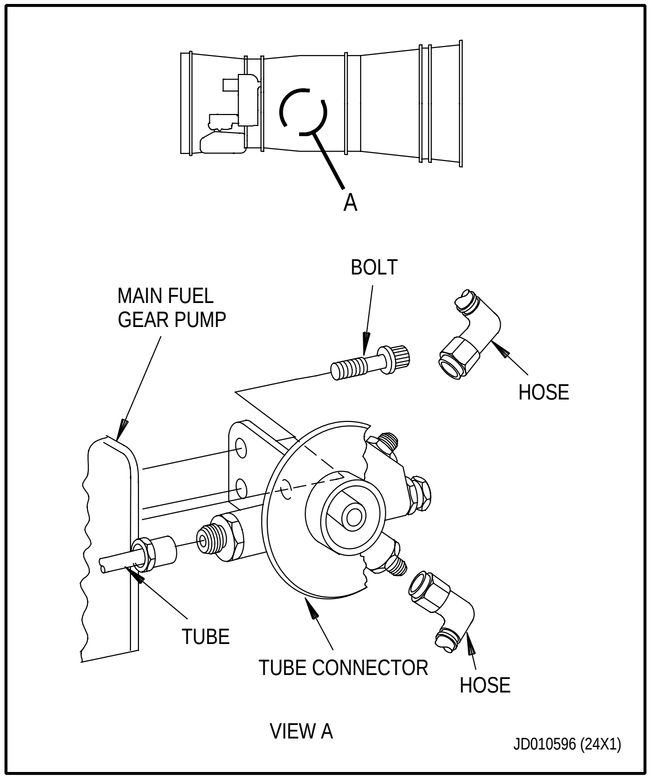


Figure 1. Front Fuel Drain Manifold Tube Connector - Removal

3. FRONT FUEL DRAIN MANIFOLD TUBE CONNECTOR - REMOVAL OF ATTACHING PARTS.
(See Figure 2.)

NOTE

Connector may be placed in soft jaw vice to facilitate removal of adapters.

a. Remove tube cap.
(See figure 2.)

b. Remove adapters and packings. Discard packings.

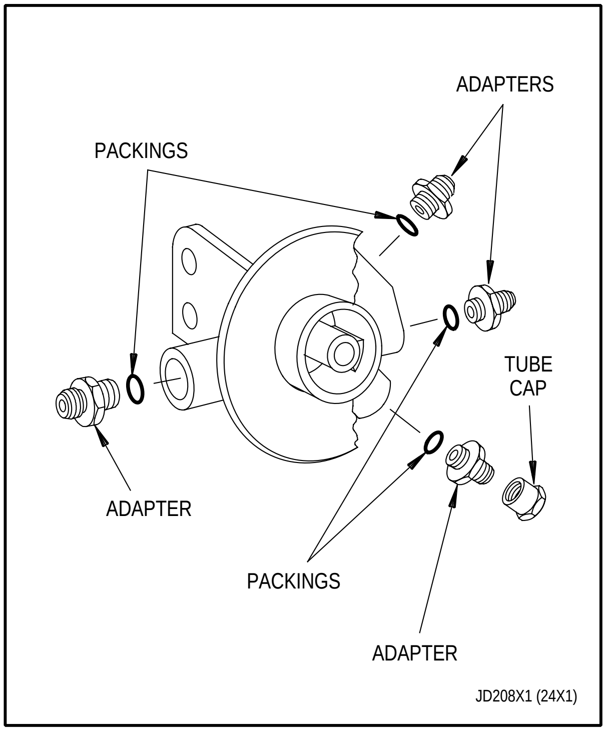


Figure 2. Front Fuel Drain Manifold Tube Connector - Removal of Attaching Parts

4. FRONT FUEL DRAIN MANIFOLD TUBE CONNECTOR, AND ATTACHING PARTS - CLEANING.

a. Clean fuel drain manifold tube connector and tube adapters with clean cloth moistened with P-D-680, Type II petroleum solvent.

b. Dry with clean, dry lint-free cloth.

5. FRONT FUEL DRAIN MANIFOLD TUBE CONNECTOR - INSPECTION.
(See Figure 3.)

a. Inspect fuel drain manifold tube connector for indications of damage. Replace if damaged.

b. Inspect threads on tube connector. Minor thread damage may be repaired with standard thread chaser or small file.

c. Inspect outboard face of tube connector flange for wear. If wear exceeds 0.005 inch maximum, replace tube connector. (See figure 3.)

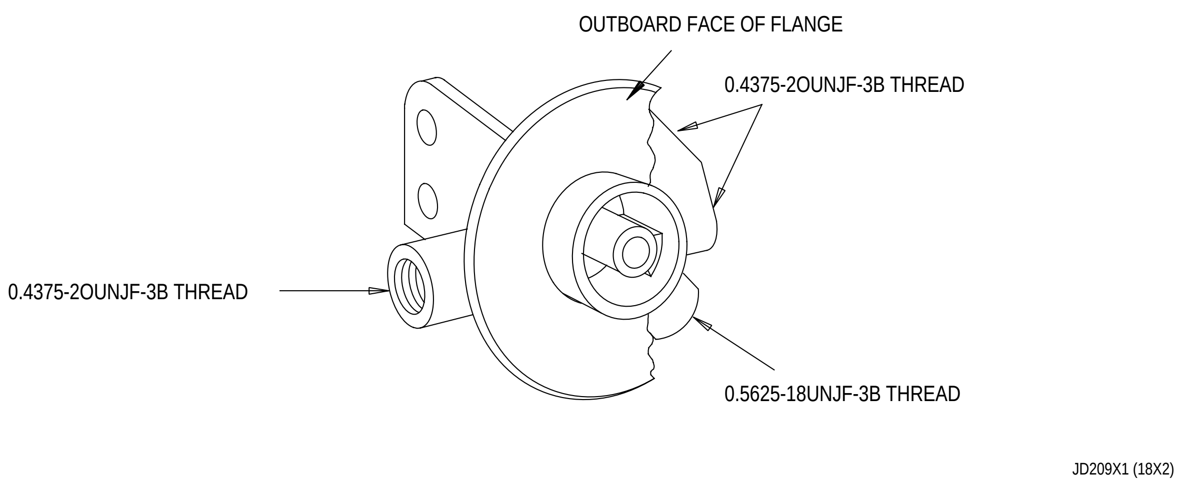


Figure 3. Front Fuel Drain Manifold Tube Connector - Inspection

6. FRONT FUEL DRAIN MANIFOLD TUBE CONNECTOR - INSTALLATION OF ATTACHING PARTS.
(See Figure 4.)

NOTE

Connector may be placed in soft jaw vice to facilitate installation and torquing of adapters and tube cap.

a. Lubricate packings with MIL-L-7808 oil or VV-P-236 petrolatum. (See figure 4.)

b. Install PN MS9966-04 packings on adapters. Lubricate threads of adapters with MIL-L-7808 oil. Torque adapters 65 to 75 pound-inches.

c. Install PN MS9966-06 packing on adapter. Lubricate threads of adapter with MIL-L-7808 oil. Torque adapter 110 to 120 pound-inches.

d. Apply PWA 550 antigalling compound to threads of tube cap. Remove excess.

e. Torque tube cap 200 to 225 pound-inches.

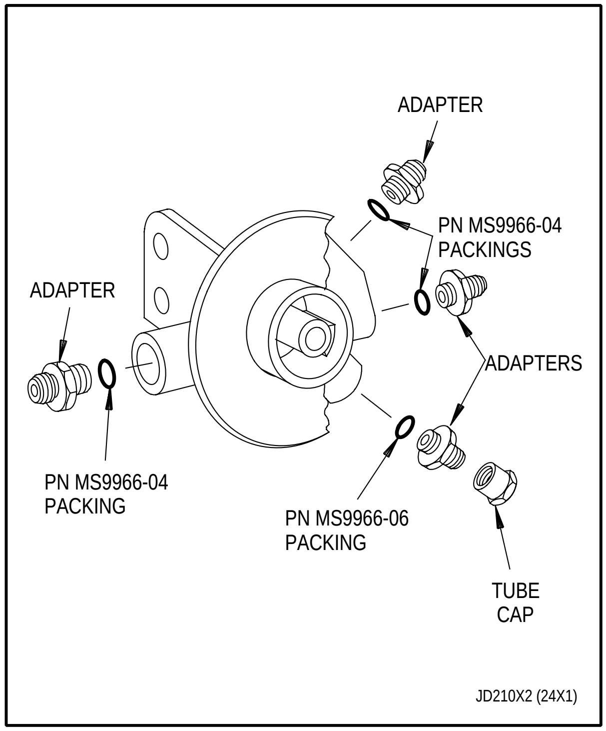


Figure 4. Front Fuel Drain Manifold Tube Connector - Installation of Attaching Parts

7. FRONT FUEL DRAIN MANIFOLD TUBE CONNECTOR - INSTALLATION.
(See Figure 5.)

a. Position front fuel drain manifold tube connector on mounting surface of main fuel gear pump. (See figure 5.)

b. Apply PWA 550 antigalling compound to threads of bolts. Remove excess.

c. Install bolts and washers to secure connector to fuel pump. Torque bolts 62 to 72 pound-inches.

d. Apply PWA 550 antigalling compound to threads of tube nuts on tube and hoses. Remove excess.

e. Connect and torque tube nut 200 to 225 pound-inches.

f. Connect and torque tube nut on hose assembly 65 to 75 pound-inches.

g. Connect and torque nut on hose assembly 340 to 375 pound-inches.

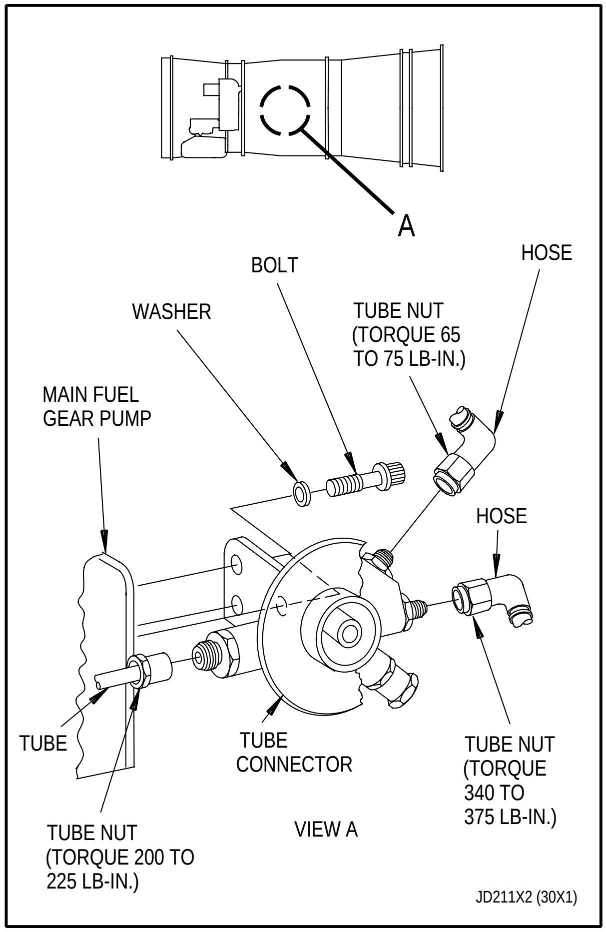


Figure 5. Front Fuel Drain Manifold Tube Connector - Installation

8. FRONT FUEL DRAIN MANIFOLD TUBE CONNECTOR - STORAGE AND SHIPMENT.

a. Drain residual fuel from manifold tube connector.

b. Wipe exterior of unit with clean cloth moistened with P-D-680, Type II petroleum solvent.

c. Dry with clean, dry lint-free cloth.

d. Wrap unit in barrier material, MIL-B-121, Type II, Grade A, Class I, or equivalent. Store in container.

e. If unit is to be shipped, pack it in shipping container. Ensure unit is cushioned with shock absorbent packing material.

WORK PACKAGE

TECHNICAL PROCEDURES

CONNECTOR, REAR - TUBE, FUEL DRAIN MANIFOLD AND BRACKET - ASSEMBLY OF

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 10

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 10	0				

REFERENCE MATERIAL REQUIRED

None

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Barrier material, grease-proofed, flexible	MIL-B-121, Type II, Grade A, Class 1
Cloth, lint-free	-
Compound, antigalling (PWA 550)	Hi-T-650 or Lubri-Bond HT
Lockwire (0.032 inch diameter)	MS9226-04
Oil, lubricating	MIL-L-7808
or Petrolatum	VV-P-236
Solvent, petroleum	P-D-680, Type II

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Packing, preformed	MS9966-04	2
Packing, preformed	MS9966-06	1
Packing, preformed	ST1001-04	1

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. There are two fuel drain manifold tube connectors on the engine. One, the front tube connector, is attached to rear of the main fuel gear pump at the 6 o’clock position. The other, the rear tube connector, is located at the 6 o’clock position aft of the augmentor fuel control.

NOTE

Rear fuel drain manifold tube connector and fuel drain manifold bracket assembly are removed from and installed on engine as a unit.

b. This work package contains instructions for the following tasks on the rear fuel drain manifold tube connector and fuel drain manifold bracket assembly:

- Removal
- Removal of attaching parts
- Inspection
- Cleaning
- Installation of attaching parts
- Installation
- Storage and shipment

2. REAR FUEL DRAIN MANIFOLD TUBE CONNECTOR AND FUEL DRAIN MANIFOLD BRACKET ASSEMBLY - REMOVAL.
(See Figure 1.)

a. Disconnect tubes from rear fuel drain manifold tube connector. (See figure 1.)

b. Remove bolts, nuts and spacer. Remove tube connector and fuel drain manifold bracket as an assembly.

c. Drain residual fuel from tube connector.

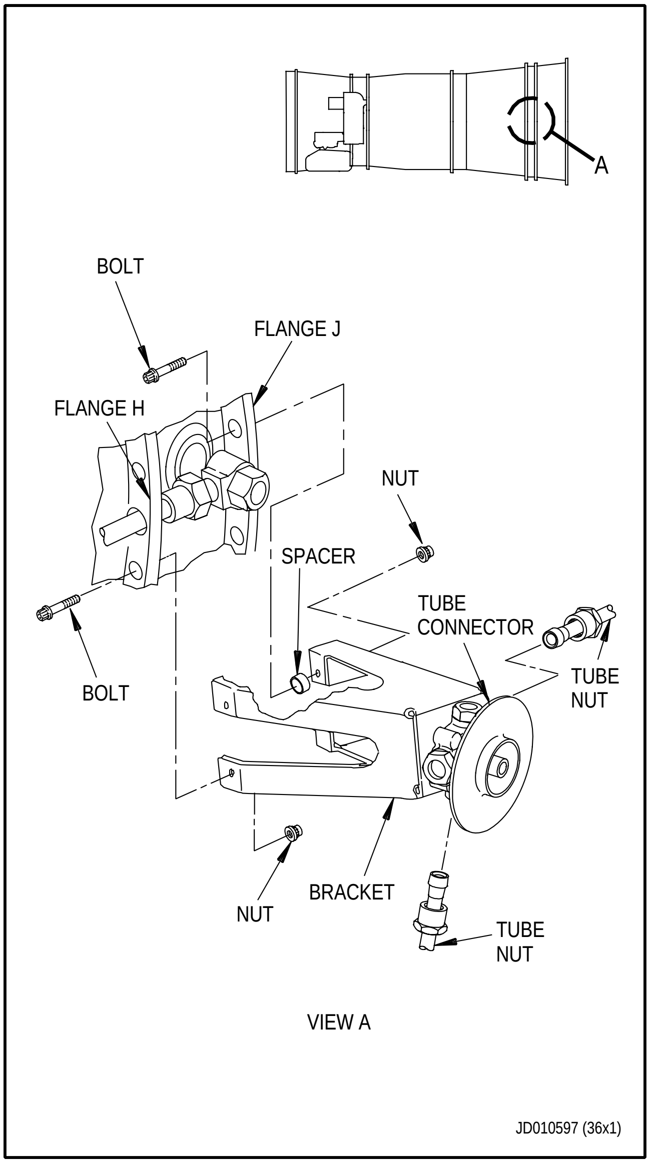


Figure 1. Rear Fuel Drain Manifold Tube Connector and Fuel Drain Manifold Bracket Assembly - Removal

3. REAR FUEL DRAIN MANIFOLD TUBE CONNECTOR AND FUEL DRAIN MANIFOLD BRACKET ASSEMBLY - REMOVAL OF ATTACHING PARTS. (See Figure 2.)

a. Remove bolts and separate rear fuel drain manifold tube connector from fuel drain manifold bracket. (See figure 2.)

NOTE

Tube connector may be placed in a soft-jawed vise to facilitate removal of attaching parts.

b. Remove plugs and adapters. Discard packings.

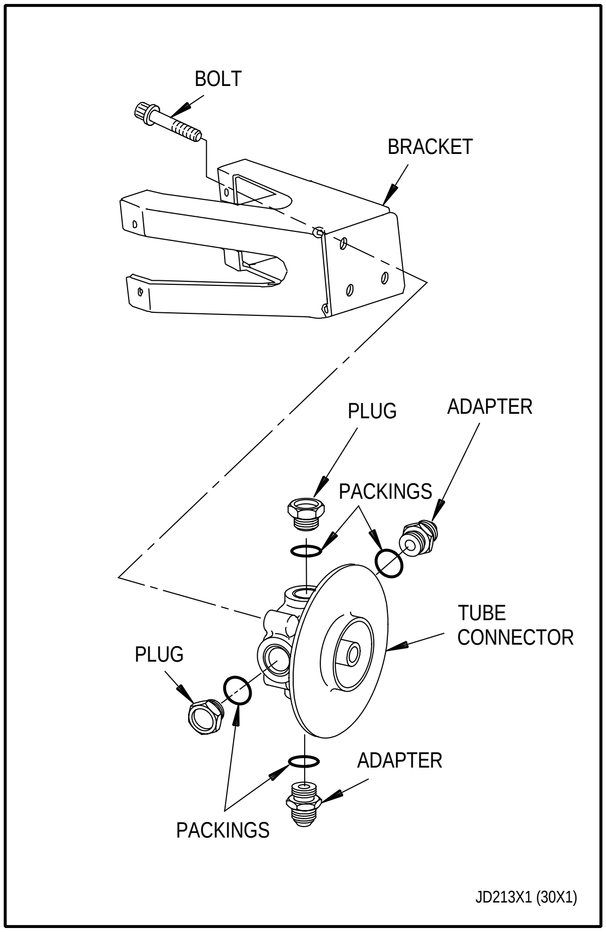


Figure 2. Rear Fuel Drain Manifold Tube Connector and Fuel Drain Manifold Bracket Assembly - Removal of Attaching Parts

4. REAR FUEL DRAIN MANIFOLD TUBE CONNECTOR, FUEL DRAIN MANIFOLD BRACKET ASSEMBLY, AND ATTACHING PARTS - CLEANING.

a. Clean fuel drain manifold tube connector, fuel drain manifold bracket assembly, and tube adapters with clean, lint-free cloth moistened with P-D-680, Type II petroleum solvent.

b. Dry with clean, dry lint-free cloth.

5. REAR FUEL DRAIN MANIFOLD TUBE CONNECTOR AND FUEL DRAIN MANIFOLD BRACKET ASSEMBLY - INSPECTION.
(See Figure 3.)

a. Inspect fuel drain manifold tube connector and fuel drain manifold bracket assembly for damage. Replace part that is damaged.

b. Inspect threads on tube connector. Minor thread damage may be repaired with standard thread chaser or small file.

c. Inspect outboard face of tube connector flange for wear. If wear exceeds 0.005 inch maximum, replace tube connector. (See figure 3.)

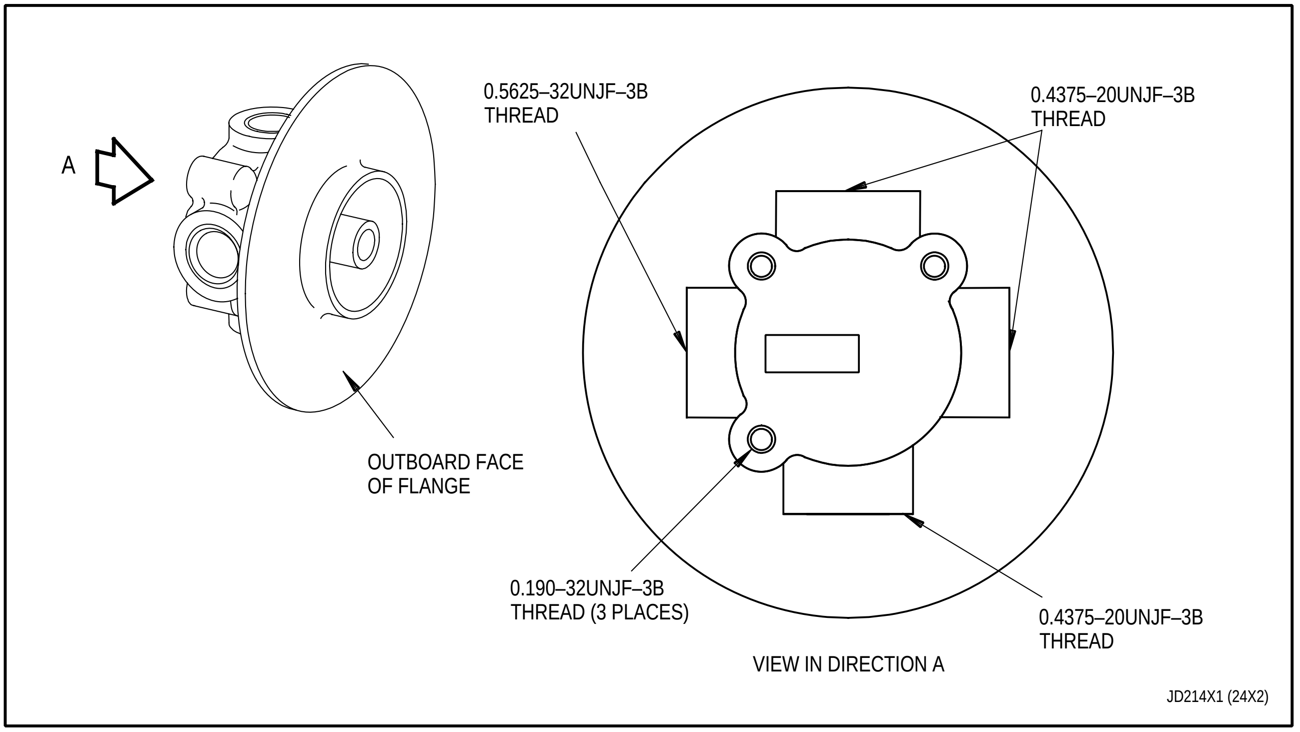


Figure 3. Rear Fuel Drain Manifold Tube Connector - Inspection

6. REAR FUEL DRAIN MANIFOLD TUBE CONNECTOR AND FUEL DRAIN MANIFOLD BRACKET ASSEMBLY - INSTALLATION OF ATTACHING PARTS.

(See Figure 4.)

NOTE

Rear fuel drain manifold tube connector may be placed in soft jawed vice to facilitate installation of tube adapters and plugs.

a. Lubricate packings with MIL-L-7808 oil or VV-P-236 petrolatum.

b. Install packings on adapters. Lubricate threads of adapters with MIL-L-7808 oil. Install and torque adapters. (See figure 4.)

c. Install packings on plugs. Lubricate threads of plugs with MIL-L-7808 oil. Install and torque plugs. (See figure 4.)

d. Lockwire plugs to tube connector with PN MS9226-04 wire.

e. Apply PWA 550 antigalling compound to threads of bolts. Remove excess.

f. Position tube connector on bracket.

g. Install bolt. Torque bolts 20 to 26 pound-inches. Lockwire bolts with PN MS9226-04 wire.

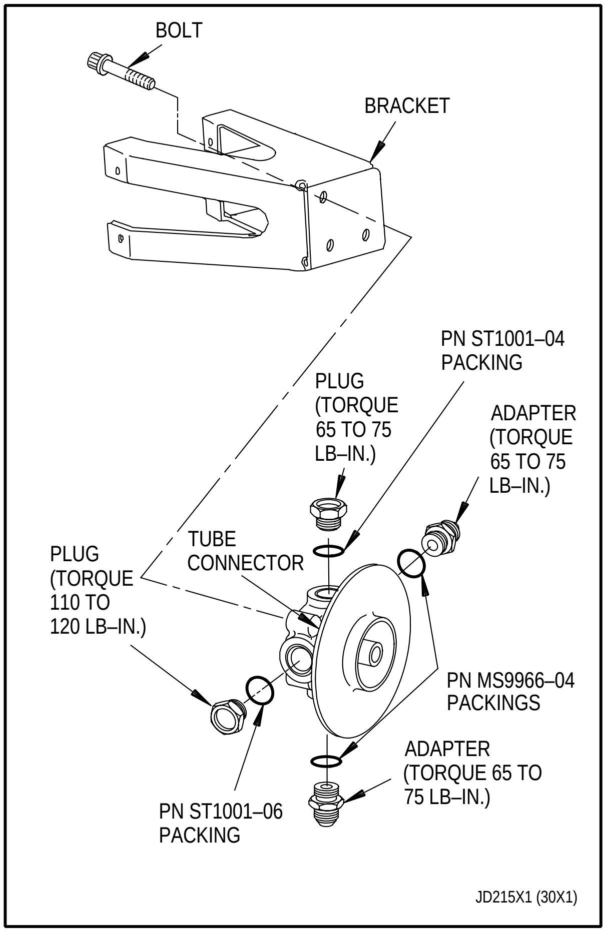


Figure 4. Rear Fuel Drain Manifold Tube Connector and Fuel Drain Manifold Bracket Assembly - Installation of Attaching Parts

7. REAR FUEL DRAIN MANIFOLD TUBE CONNECTOR AND FUEL DRAIN MANIFOLD BRACKET ASSEMBLY - INSTALLATION.
(See Figure 5.)

a. Apply PWA 550 antigalling compound to threads of bolts.

b. Position fuel drain manifold tube connector and bracket assembly over boltholes in flanges H and J. (See figure 5.)

c. Install bolts, nuts and spacer.

d. Torque nuts 20 to 26 pound-inches.

e. Apply PWA 550 antigalling compound to threads of tube nuts. Remove excess.

f. Connect tube nuts and torque 65 to 75 pound-inches.

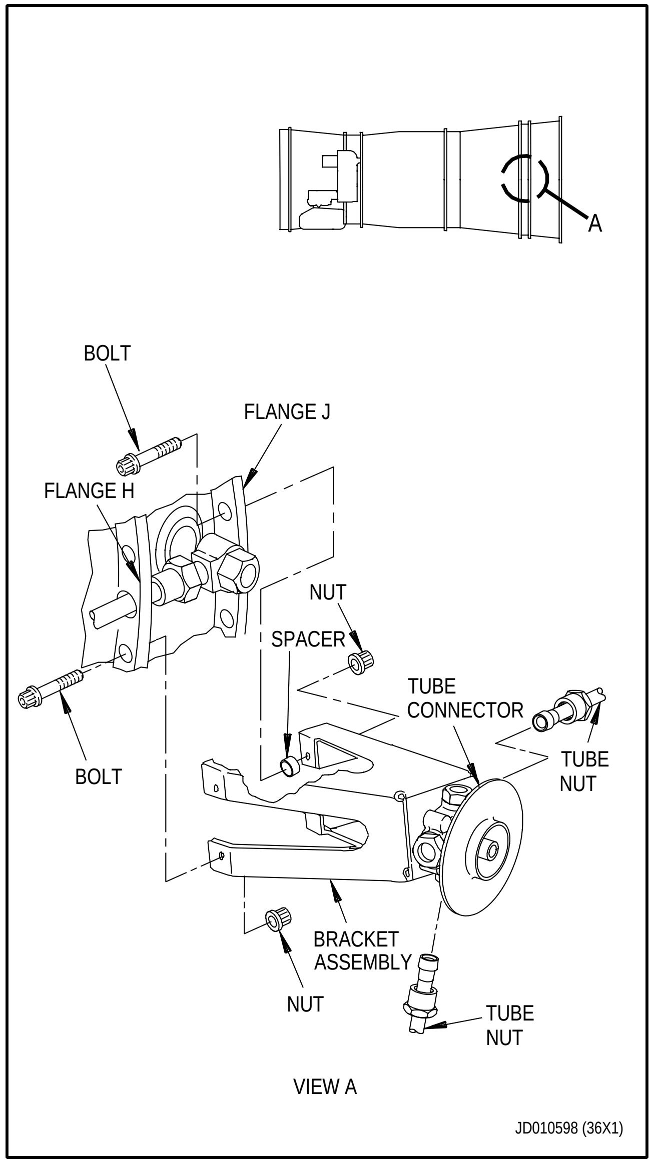


Figure 5. Rear Fuel Drain Manifold Tube Connector and Fuel Drain Manifold Bracket Assembly - Installation

8. REAR FUEL DRAIN MANIFOLD TUBE CONNECTOR AND FUEL DRAIN MANIFOLD BRACKET ASSEMBLY - STORAGE AND SHIPMENT.

a. Drain residual fuel from manifold tube collector.

b. Wipe exterior of tube connector and bracket assembly with clean cloth moistened with P-D-680, Type II, petroleum solvent.

c. Dry with clean, dry lint-free cloth.

d. Wrap tube connector and bracket assembly separately in barrier material, MIL-B-121, Type II, Grade A, Class I or equivalent.

e. If tube connector or bracket assembly is to be shipped, pack it in shipping container. Ensure that it is cushioned with shock absorbent packing material to protect it from rough handling during shipment.

WORK PACKAGE

TECHNICAL PROCEDURES

PROBE ASSEMBLY - TOTAL PRESSURE (Pt6)

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 12

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 3	8				
4 - 9	0				
10 - 12	8				

REFERENCE MATERIAL REQUIRED

Title	Number
Standard Maintenance Procedures - - - - - - - - - - - - - - - - -	T.O. 2-1-111
Introduction and General Information - - - - - - - - - - - - - -	T.O. 2J-F100-53-1
General Cleaning Procedures - Cleaning, Vapor Degreasing (SPOP 3) -	SWP 031 01
General Cleaning Procedures - Cleaning, Alkaline Rust Remover, Long Soak (SPOP 203) - - - - - - - - - - - - - - - - -	SWP 031 09

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Adhesive/Sealant, silicone rubber	DC93-076
Alcohol, isopropyl	TT-I-735
Barrier, material	MIL-B-121, Type II, Grade A, Class 1
Bristle brush, small	-
Cloth, lint-free	-
Compound, antigalling (PWA 550)	Hi-T-650 or Lubri-Bond HT
Grit, silicon carbide	Silicon Carbide 120
Oil, lubricating	MIL-L-7808
Solvent, petroleum	P-D-680, Type II
Tape, masking, metallic (lead foil) PMC 4138	Scotch No. 421 Lead Foil Tape

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
4	Total Pressure Probe Assembly - Inspection Regulator assembly, air pressure ----	 PWA 21875
5	Total Pressure Probe Assembly - Installation Vacuum Tester Set --------------	 PWA 57796

ILLUSTRATED SUPPORT EQUIPMENT

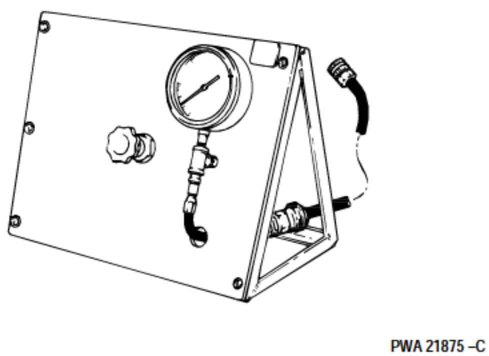


Figure T1. PWA 21875 Regulator

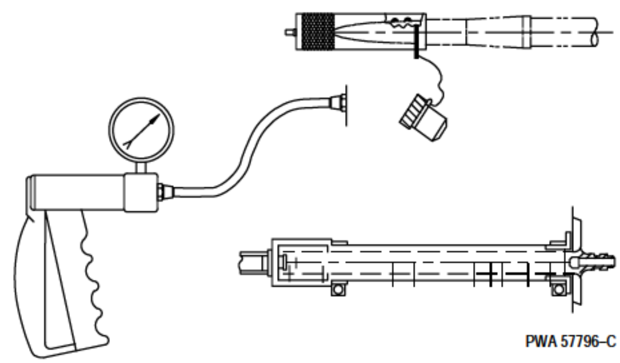


Figure T2. PWA 57796 Vacuum Tester Set

1. INTRODUCTION.

a. This work package contains instructions for the following tasks on the total pressure probe assembly:

- Removal
- Cleaning
- Inspection
- Installation
- Storage and shipment

2. TOTAL PRESSURE PROBE ASSEMBLY - REMOVAL.
(See Figure 1.)

a. Remove total pressure probe assembly. (See figure 1.)

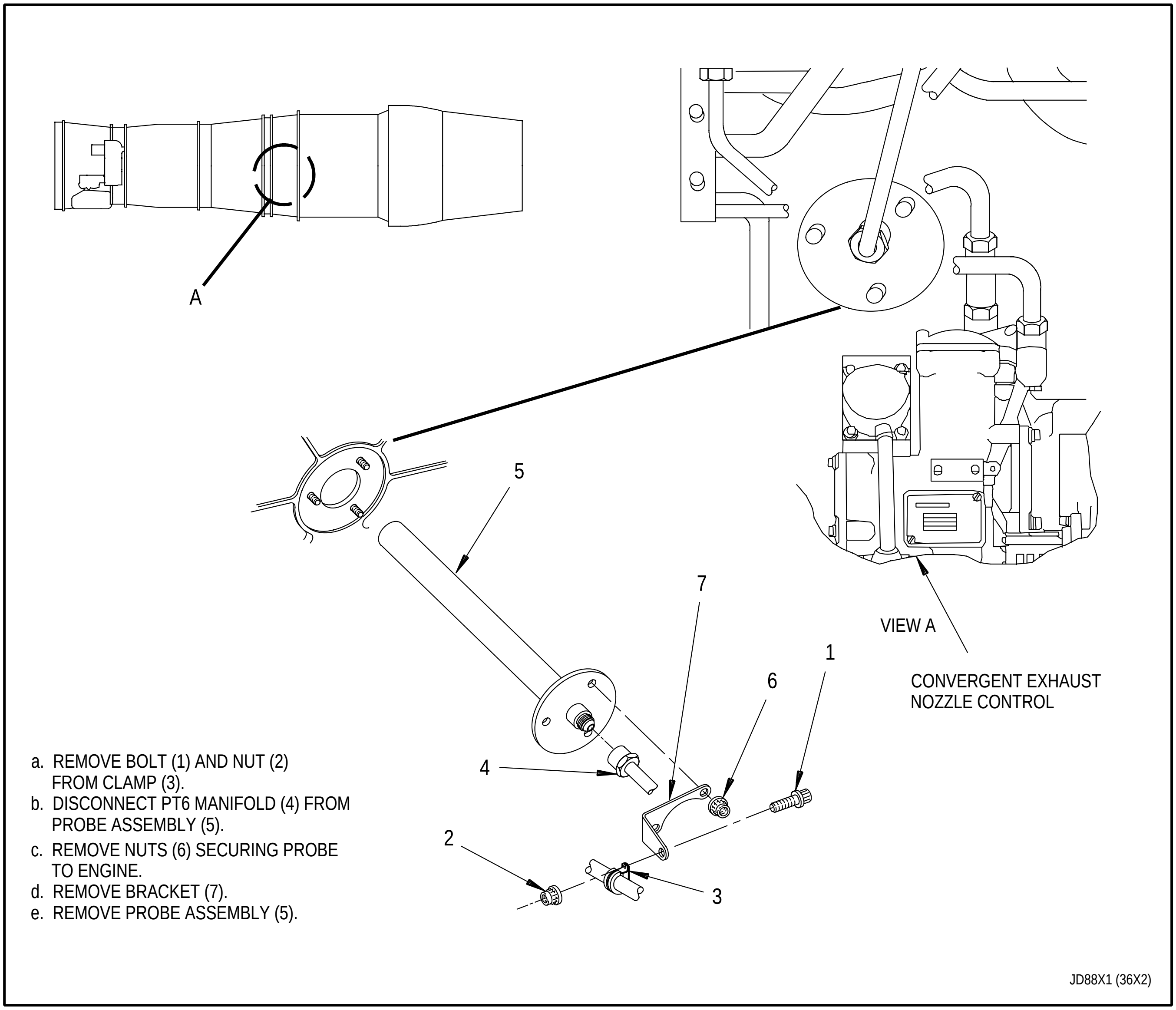


Figure 1. Total Pressure Probe Assembly - Removal

3. TOTAL PRESSURE PROBE ASSEMBLY - CLEANING.

a. Flush inside of probe assembly with P-D-680, Type II petroleum solvent.

b. Clean outer surfaces of probe with P-D-680, Type II petroleum solvent and small bristle brush.

c. Drain probe thoroughly and dry with clean compressed air at less than 30 psig.

d. If harder to clean soils are encountered, clean as follows:

(1) Remove excess oil. Refer to T.O. 2J-F100-53-1, SWP 031 01.

(2) Clean total pressure probe assembly. Refer to T.O. 2J-F100-53-1, SWP 031 09.

(3) Power flush probe with cold water.

(4) Dry probe with clean compressed air at less than 30 psig.

4. TOTAL PRESSURE PROBE ASSEMBLY - INSPECTION.
(See Figures 2 and 3.)

a. Visually inspect total pressure probe assembly. (See figure 2.)

b. Fluorescent penetrant inspect the total pressure probe assembly for cracks. Refer to T.O. 2-1-111. Cracks are not permissible.

c. Pressure test probe assembly. (See figure 3.)

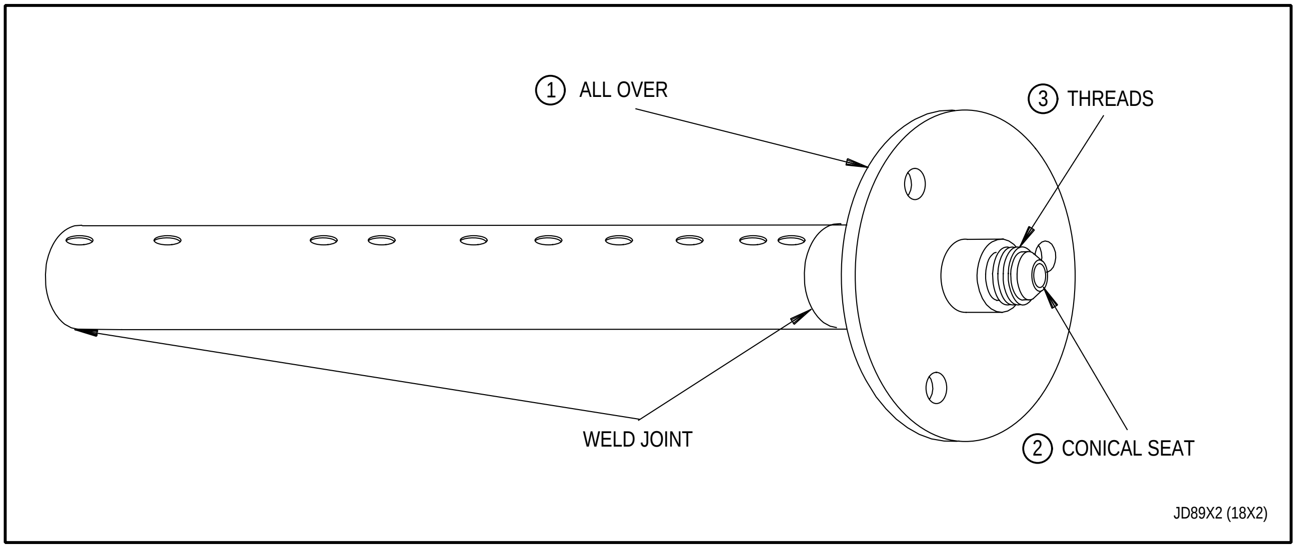


Figure 2. Total Pressure Probe Assembly - Inspection

Legend for figure 2

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. All over -			
Dirty	Not serviceable	See corrective action.	Clean per paragraph 3.
Cracks	Not serviceable	Not reparable	Replace probe assembly.
2. Conical seat -			
Damaged	Not serviceable	Not reparable	Replace probe assembly.
3. Threads -			
Damaged	Not serviceable	Minor damage reparable	Clean up minor thread damage with standard thread chaser or small file. Replace probe having damage that cannot be cleaned up with thread chaser.

a. CONNECT SHOP AIR (1) TO PWA 21875 REGULATOR (2).
b. COVER LEADING EDGE ORIFICES WITH LEAD TAPE.
c. CONNECT LOCALLY MANUFACTURED HOSE (3) TO REGULATOR AND PROBE ASSEMBLY (4).
d. APPLY 40 TO 50 PSIG OF PRESSURE.
e. IMMERSE PROBE ASSEMBLY (4) IN WATER AND CHECK FOR AIR BUBBLES.
f. REPLACE PROBE ASSEMBLY (4) IF AIR BUBBLES ARE PRESENT.
g. AFTER TEST CLEAN PROBE ASSEMBLY (4) TO REMOVE TAPE FROM LEADING EDGE ORIFICES.

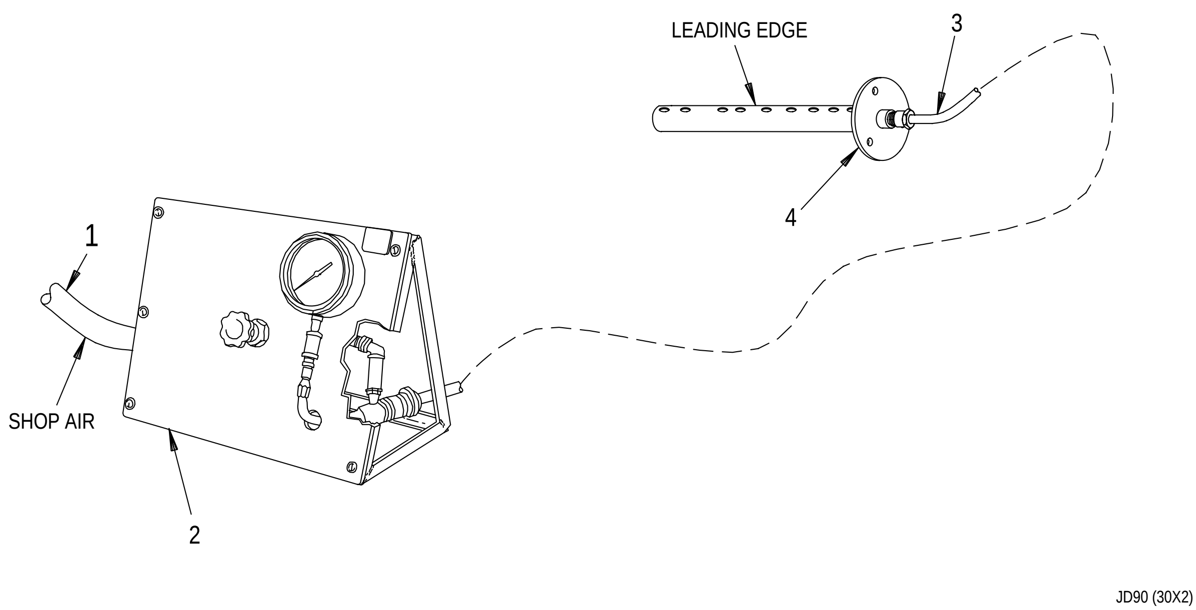


Figure 3. Total Pressure Probe Assembly - Pressure Test

5. TOTAL PRESSURE PROBE ASSEMBLY - INSTALLATION.

(See Figure 4.)

a. Install total pressure probe assembly (Pt6). (See figure 4.)

b. Perform Pt6 Plumbing Integrity Check as follows:

WARNING

Working gloves are recommended for installing PWA 57796 Pt6 adapter to avoid injuring hands.

CAUTION

To prevent engine damage, do not put cap in engine.

(1) Connect PWA 57796 Pt6 adapter to vacuum pump. Remove Pt6 adapter cap before using tool.

(2) Carefully slide PWA 57796 DEEC Vacuum Tester on installed Pt6 probe.

(3) Lubricate Pt6 probe with MIL-L-7808 as required.

CAUTION

- Do not apply pressure to Pt6 system. Damage may occur.
- Do not use liquids to check Pt6 system for leaks. DEEC transducer may be damaged.

(4) Evacuate Pt6 system, using hand vacuum pump until gage reads 8 to 16 inch HG. (4 to 8 PSIA). Monitor pump for 60 seconds. If leak is detected, look for Pt6 leaks in following areas and repeat this procedure until corrected:

(a) Preformed packings in PWA 57796 Pt6 adapter.

(b) External plumbing.

(c) Pt6 probe.

(5) Release pressure to Pt6 probe prior to removing vacuum pump.

(6) Remove vacuum pump from probe.

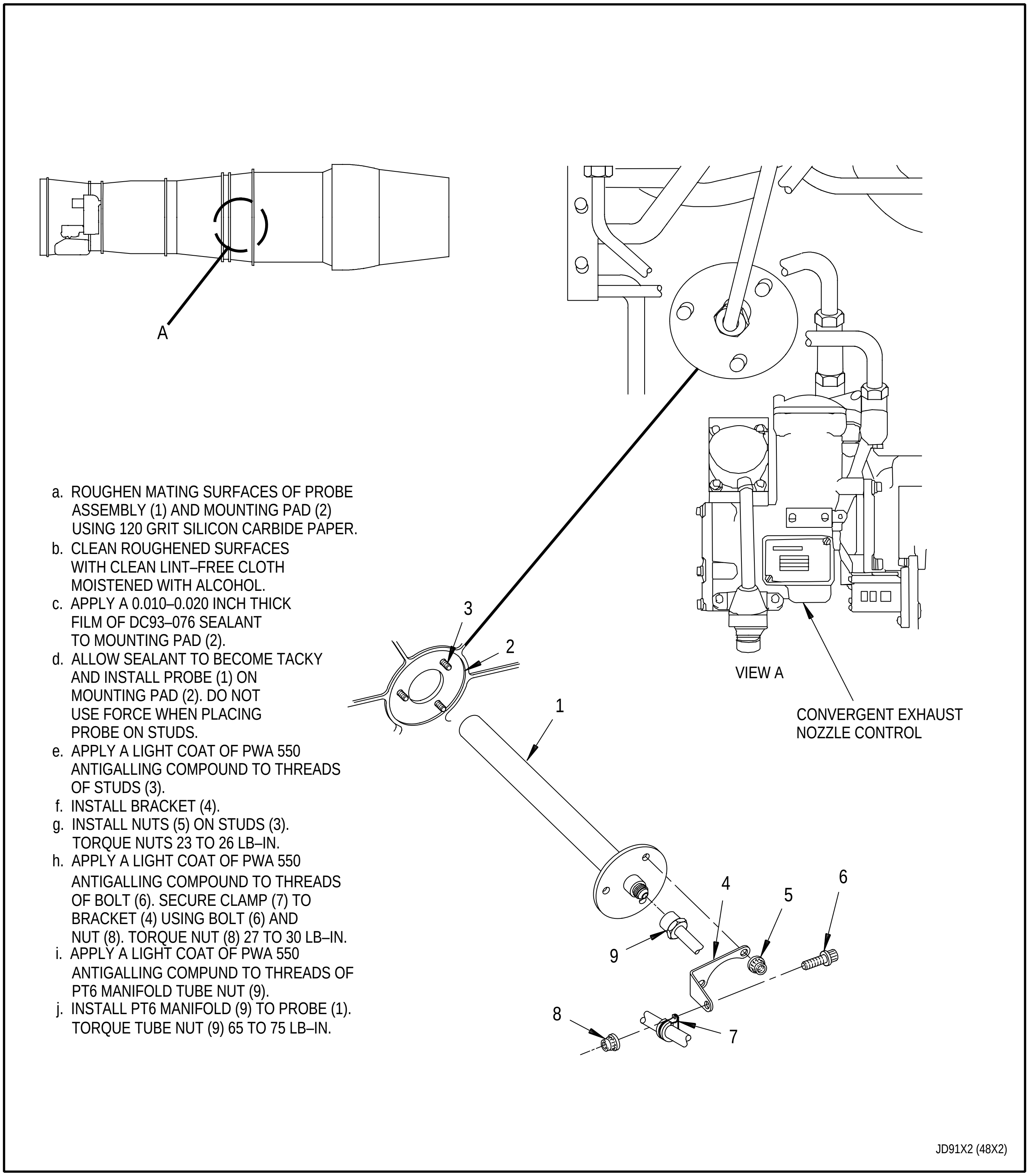


Figure 4. Total Pressure Probe Assembly - Installation

6. TOTAL PRESSURE PROBE ASSEMBLY - STORAGE AND SHIPMENT.

a. Wipe exterior of assembly with clean cloth moistened with petroleum solvent, P-D-680, Type II.

b. Dry with clean, dry lint-free cloth.

c. Wrap assembly in barrier material, MIL-B-121, Type II, Grade A, Class 1, or equivalent, and store in container.

d. If assembly to be shipped, pack in shipping container. Ensure that it is cushioned with shock absorbent packing material to protect it from rough handling during shipment.

WORK PACKAGE

TECHNICAL PROCEDURES

CABLES - ELECTRICAL, SPECIAL PURPOSE

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 70

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	22	24	6	44	6
2	17	24A	11	45	16
3	11	24B Blank Added	6	46	17
4 - 6	0	25	6	47	0
7	16	26	11	48	6
8	17	26A - 26B	5	49	2
9 - 10	0	26C - 26D	11	50	6
11	22	26E - 26H Added	11	51	2
12	0	27	8	52	6
13	22	28	16	53	16
14	0	29 - 37	0	54	6
15	16	38 Blank	0	55	16
16 - 17	0	39	0	56	17
18	17	40 Blank	0	57	1
19 - 20	0	41 - 42	9	58 - 59	6
21 - 22	5	43	0	60	5
23	11				

REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information	T.O. 2J-F100-53-1
General Procedures	WP 021 00
Engine Accessories and Rigging Procedures	T.O. 2J-F100-53-4
Control - Fuel, Main	WP 009 00
Engine	T.O. 2J-F100-53-5
Tubing and Clamping	WP 064 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

T. O. No.	Date	Level	Title (ECP No.)
T.O.2J-F100229-562	30 SEP 95	O/I	Retrofit of generator cable connector clamp PN 4082678-01 and attaching hardware, F100-PW-229 Engine, F-15/ F-16 Aircraft. (ECP 94QA072)

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
ALCOHOL, DENATURED OR TRICHLOROETHANE INHIBITED -1,1,1	O-E-760, TYPE III O-T-620
BRUSH, NONMETALLIC, SOFT BRISTLED	H-B-1490/3T1
BRUSH, NONMETALLIC, STIFF BRISTLED	-
CLOTH, LINT-FREE	-
COMPOUND, ANTIGALLING (PWA 36545)	EVERLUBE 382
COMPOUND, ANTIGALLING (PWA 550)	HI-T-650 OR LUBRI-BOND HT
FLUID, CLEANING	SPARKLEEN CAT # 04320
LOCKWIRE(0.032 INCH DIAMETER)	MS9226-04
OIL, LUBRICATING	MIL-L-7808
PETROLATUM, WHITE	VV-P-236
SOLVENT, PETROLEUM	P-D-680, TYPE II
TAPE, GLASS	MIL-I-19166 OR NO. 69 FIBERGLASS 3M CO
YARN, NOMEX GRAY	SPES PN 156416-0008

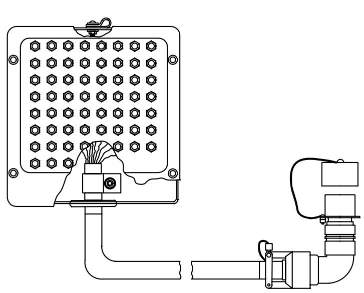
EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Electrical cable tie	ST2625-03	As required
Needle	FF-N-180,Type 1, Class 4, Size 0 Light	1
Packing, preformed	MS9386-122	7

APPLICABLE SUPPORT EQUIPMENT

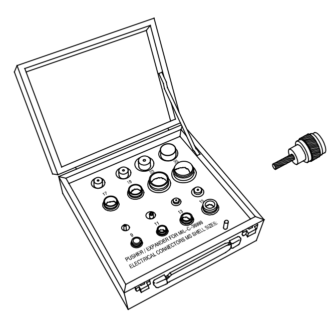
Paragraph	Function - Tool Nomenclature	Tool Number
13	SPECIAL PURPOSE ELECTRICAL CABLES AND CONNECTOR - REPAIR	
	SET-PUSHER/EXPANDER, ELECTRICAL CONNECTOR EMI BAND REPAIR	PWA 70765
14	SPECIAL PURPOSE ELECTRICAL CABLES - TESTING	
	CABLE TEST SET	PWA 56042
	OHMMETER, PSM-6	NSN 6625-00-643-1686
15	THERMOCOUPLE SPECIAL PURPOSE ELECTRICAL BRANCHED CABLE (RED) - INSTALLATION	
	TAP, THREAD 10-32-UNJF-3B	TAPCO PN 72072

ILLUSTRATED SUPPORT EQUIPMENT



PWA 56042 –C

Figure T1. PWA 56042 Cable Test Set



PWA 70765 –C

Figure T2. PWA 70765 EMI Band Tool Set

1. INTRODUCTION.

a. This work package contains the following maintenance procedures for the special purpose electrical cables:

- Removal
- Cleaning
- Inspection
- Repair
- Testing
- Installation

2. THERMOCOUPLE SPECIAL PURPOSE ELECTRICAL BRANCHED CABLE (RED) - REMOVAL.

(See Figure 1.)

a. Remove electrical cable ties as necessary to remove cable. (See figure 1.)

NOTE

Do not remove screw when disengaging upper half of hinged cushioned loop clamps. Turn screw while depressing spring until square nut aligns with square hole in clamp. Open clamp leaving screw and nut attached to upper half of clamp.

b. Disengage upper half of hinged cushioned loop clamps holding cable in place.

c. Remove bolts from hinged clamps holding cable in place on digital electronic engine control (DEEC). Loosely install bolts on clamps after cable is clear.

d. Remove FTIT sensing thermocouple connectors P-43, P-44, P-38, P-39, P-40, P-41, and P-42 as follows:

NOTE

Bolts and washers are captive.

(1) Loosen bolts to disengage thermocouple cable from thermocouple.

(2) Remove and discard packing.

e. Disconnect connector P-81 from DEEC.

f. Disconnect connector P-48 from engine diagnostic unit.

g. Disconnect connectors J-50, J-51, and J-70 from EDU to gain access to red cable.

h. Remove bolts securing T_{t2} A and T_{t2}B sensors.

i. Carefully remove cable with T_{t2} A and T_{t2} B sensors attached. Loosely install bolts into fan case after cable is clear.

j. Remove cable from engine ensuring not to bend cable to a radius of less than 5 inches minimum.

k. Place protective closures on thermocouples, DEEC, and engine diagnostic unit.

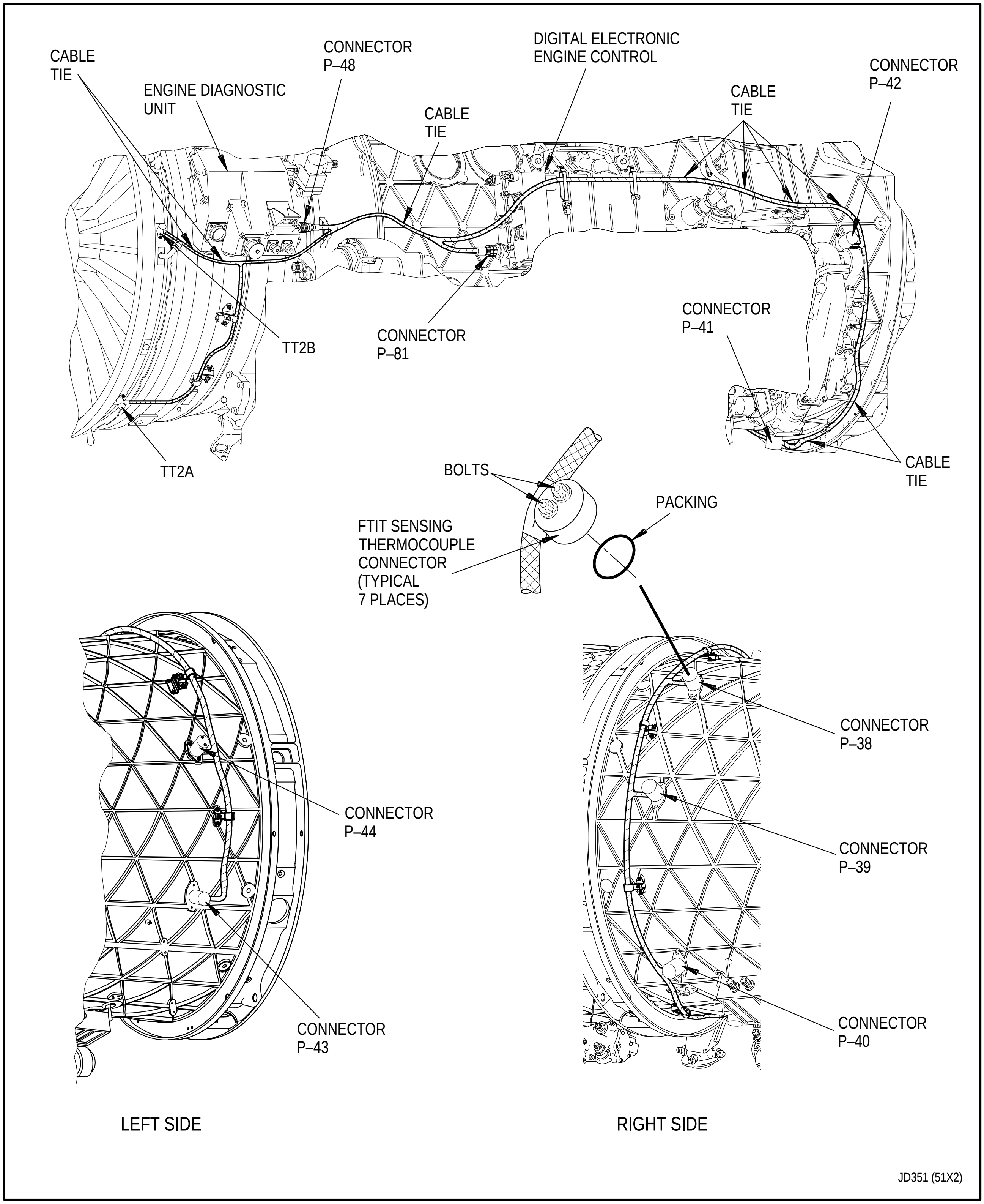


Figure 1. Thermocouple Special Purpose Electrical Branched Cable - Removal

3. ENGINE ACCESSORIES SPECIAL PURPOSE ELECTRICAL BRANCHED (GREEN) CABLE - REMOVAL.
(See Figure 2.)

a. Remove electrical cable ties as necessary to remove cable. (See figure 2.)

NOTE

- Do not remove nut when disengaging upper half of block clamps. Loosen nut until upper half of block clamp slides freely.
- Do not remove screw when disengaging upper half of hinged cushioned loop clamps. Turn screw while depressing spring until square nut aligns with square hole in clamp. Open clamp leaving screw and nut attached to upper half of clamp.

b. Disengage upper half of hinged cushioned loop clamps and upper half of block clamps holding cable in place.

c. Remove nuts and bolts from loop clamps holding cable in place. Loosely install nuts, bolts, and loop clamp onto case or connecting bracket.

d. Remove bolts from hinged clamps holding cable in place on DEEC and gearbox bracket. Loosely install bolts on clamps after cable is clear.

e. Disconnect the following cable connectors:

(1) P-7 from engine exhaust nozzle position transmitter.

(2) P-8 from oil pressure transmitter.

(3) P-51 from engine diagnostic unit.

(4) P-149 from anti-icing valve.

f. Remove cable ensuring not to bend cable to a radius of less than 5 inches.

g. Place protective closures on receptacles of anti-icing valve, oil pressure transmitter, engine exhaust nozzle position transmitter, and engine diagnostic unit.

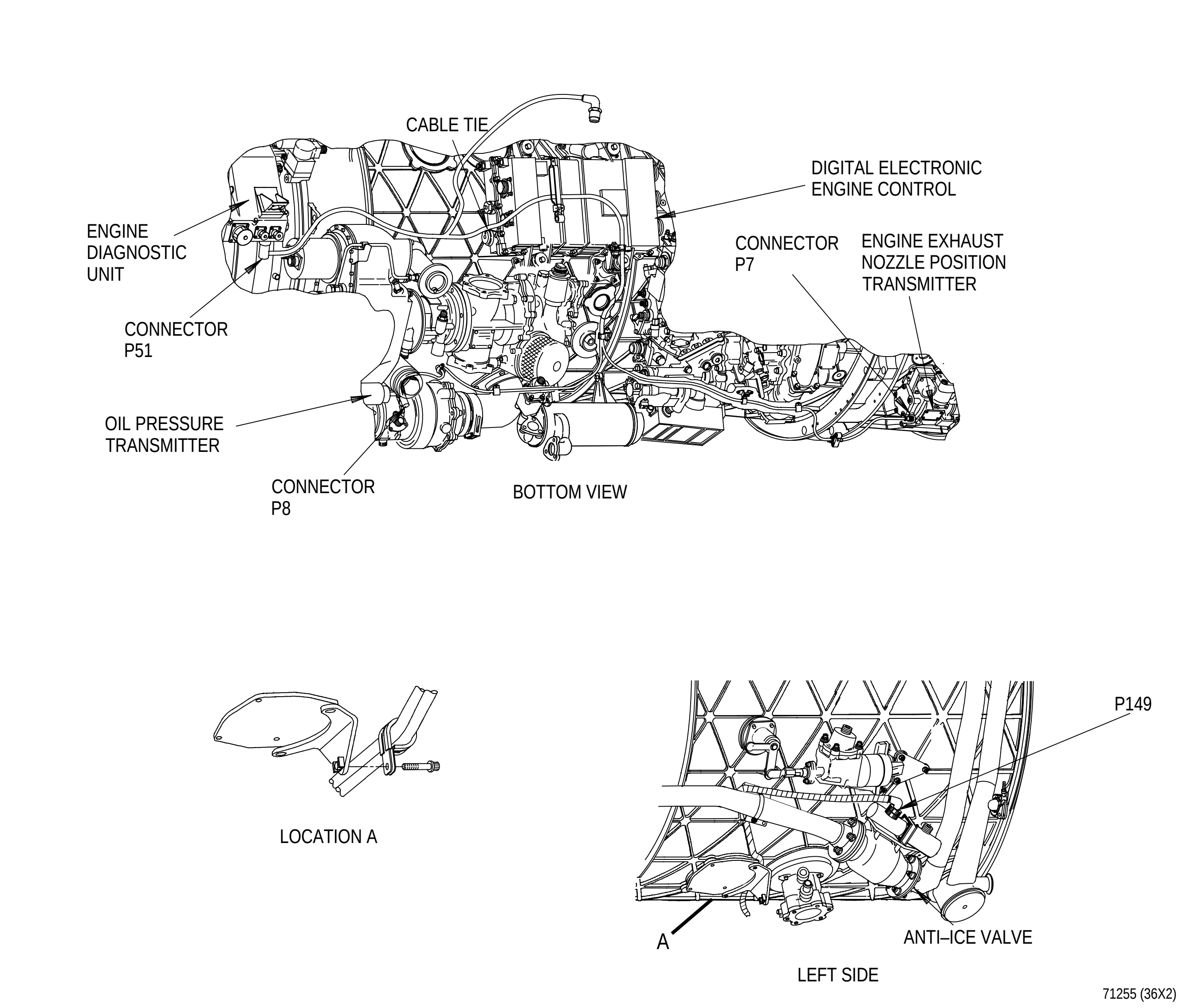


Figure 2. Engine Accessories Special Purpose Electrical Branched Cable - Removal

4. IGNITION SPECIAL PURPOSE ELECTRICAL BRANCHED CABLE (WHITE) - REMOVAL.
(See Figure 3.)

a. Remove electrical cable ties as necessary to remove cable. (See figure 3.)

NOTE

Do not remove screw when disengaging upper half of hinged cushioned loop clamps. Turn screw while depressing spring until square nut aligns with square hole in clamp. Open clamp leaving screw and nut attached to upper half of clamp.

b. Disengage upper half of hinged cushioned loop clamps holding cable in place.

c. Remove bolts from hinged clamps holding cable in place on DEEC and gearbox bracket. Loosely install bolts on clamps after cable is clear.

d. Remove cable connector clamp (after TCTO 2J-F100229-562). Disconnect connector P-119 from generator.

e. Disconnect two connectors P-26 from dual ignition exciters on right and left side of engines.

f. Disconnect connector P-104 from augmentor fuel control.

g. Disconnect connector P-113 from main fuel control.

h. Remove cable ensuring not to bend cable to a radius of less than 5 inches.

i. Place protective closures on receptacles on generator, left and right dual ignition exciters, and augmentor fuel control.

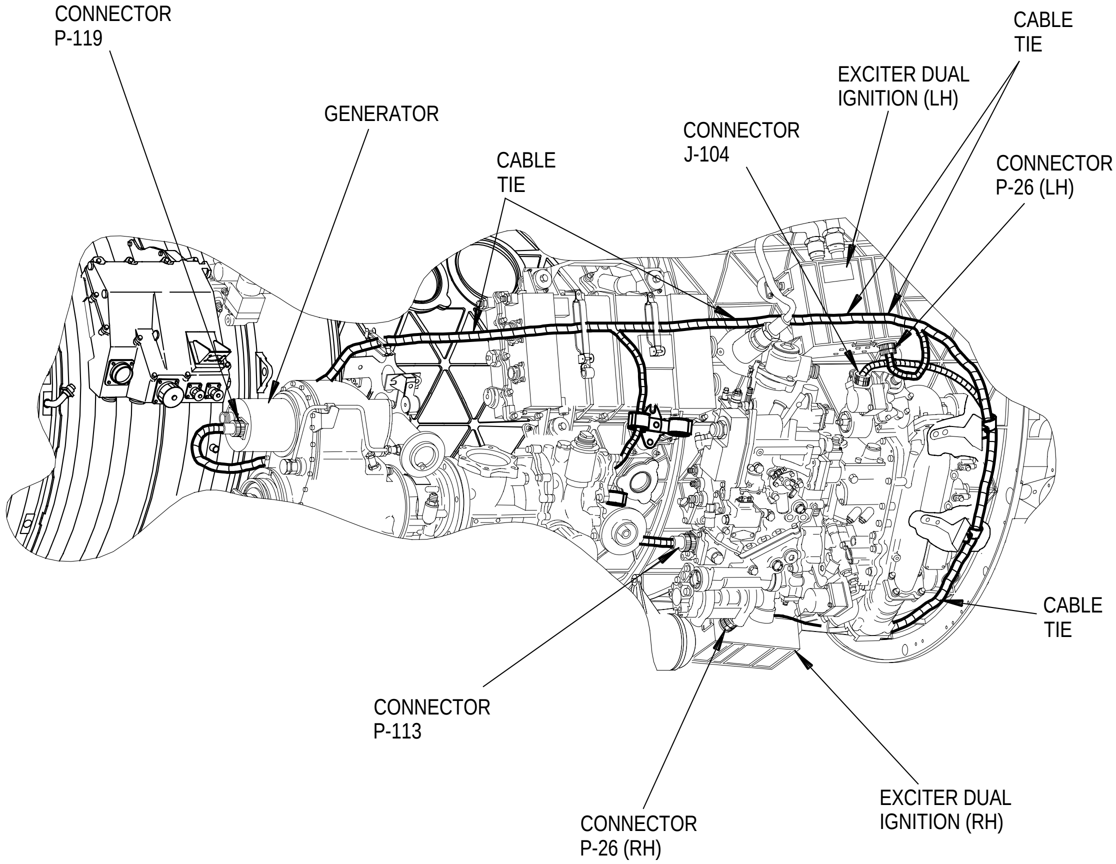


Figure 3. Ignition Special Purpose Electrical Branched Cable - Removal

5. GAS GENERATOR CONTROL SPECIAL PURPOSE ELECTRICAL BRANCHED CABLE (BROWN) - REMOVAL.

(See Figure 4.)

a. Remove electrical cable ties as necessary to remove cable. (See figure 4.)

NOTE

Do not remove screw when disengaging upper half of hinged cushioned loop clamps. Turn screw while depressing spring until square nut aligns with square hole in clamp. Open clamp leaving screw and nut attached to upper half of clamp.

b. Disengage upper half of hinged cushioned loop clamps holding cable in place.

c. Disconnect connector P83 from DEEC.

d. Disconnect connectors P-107, P-108, P-109, P-110 and P-111 from main fuel control.

e. Remove cable ensuring not to bend cable to a radius of less than 5 inches.

f. Place protective closures on receptacles on DEEC and main fuel control.

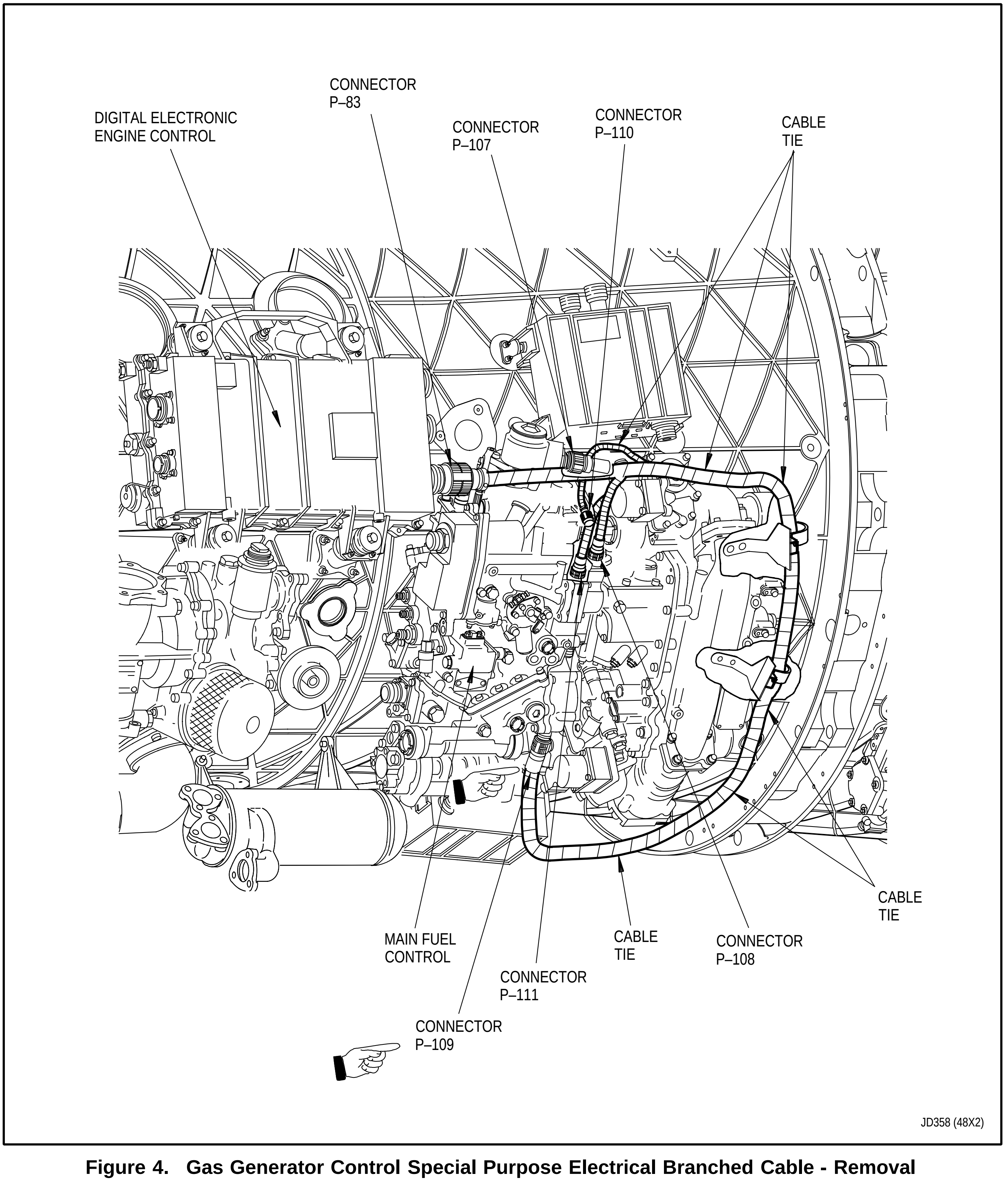


Figure 4. Gas Generator Control Special Purpose Electrical Branched Cable - Removal

6. AUGMENTOR FUEL MANAGEMENT SPECIAL PURPOSE ELECTRICAL BRANCHED CABLE (GRAY) - REMOVAL.

(See Figure 5.)

a. Remove electrical cable ties as necessary to remove cable. (See figure 5.)

NOTE

Do not remove screw when disengaging upper half of hinged cushioned loop clamps. Turn screw while depressing spring until square nut aligns with square hole in clamp. Open clamp leaving screw and nut attached to upper half of clamp.

b. Disengage upper half of hinged cushioned loop clamps holding cable in place.

c. Disconnect connector P-84 from DEEC.

d. Disconnect connectors P-97, P-98, P-99, P-100, P-101, P-102, and P-103 from augmentor fuel control.

e. Remove cable ensuring not to bend cable to a radius of less than 5 inches.

f. Place protective closures on receptacles on DEEC and augmentor fuel control.

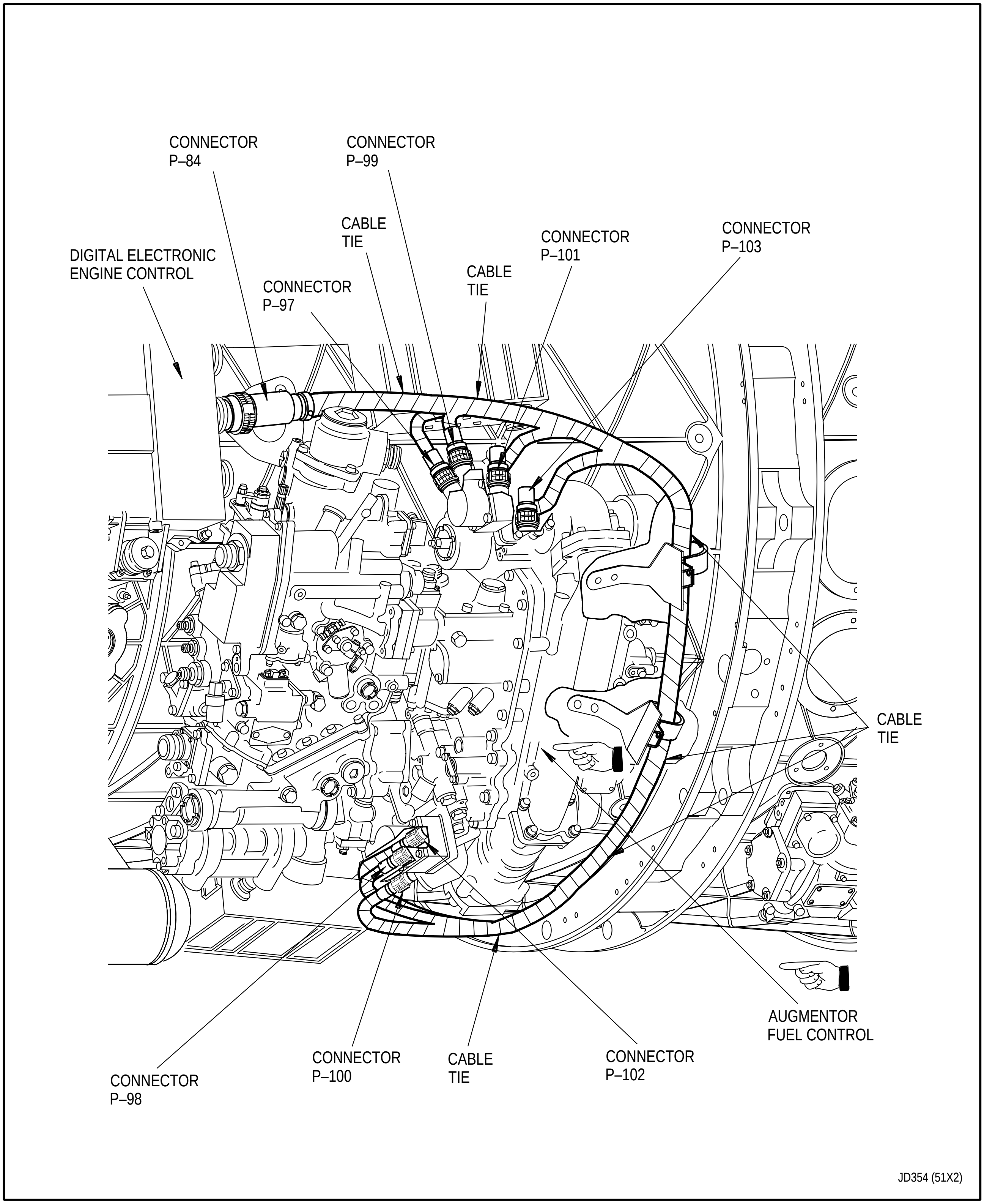


Figure 5. Augmentor Fuel Management Special Purpose Electrical Branched Cable - Removal

7. ENGINE ACTUATOR SPECIAL PURPOSE ELECTRICAL BRANCHED CABLE (YELLOW) - REMOVAL.
(See Figure 6.)

a. Remove electrical cable ties as necessary to remove cable.

NOTE

- Do not remove nut when disengaging upper half of block clamps. Loosen nut until upper half of block clamp slides freely.
- Do not remove screw when disengaging upper half of hinged cushioned loop clamps. Turn screw while depressing spring until square nut aligns with square hole in clamp. Open clamp leaving screw and nut attached to upper half of clamp.

b. Disengage upper half of hinged cushioned loop clamps and upper half of block clamps holding cable in place.

c. Remove bolt from loop clamp holding cable in place. Loosely install bolt and loop clamp onto case.

d. Remove bolts from hinged clamps holding cable in place on DEEC and gearbox bracket. Loosely install bolts on clamps after cable is clear.

e. Disconnect connectors P-93 and P-94 from compressor inlet variable vane (CIVV) control and cylinder.

f. Disconnect connectors P-89 and P-90 from rear compressor variable vane (RCVV) actuating cylinders on left and right side of engine.

g. Disconnect connector P-150 from anti-icing valve.

h. Disconnect connector P-85 from DEEC.

i. Disconnect connectors P-91 and P-92 from convergent exhaust nozzle control.

j. Remove cable ensuring not to bend to a radius of less than 5 inches.

k. Place protective closures on CIVV control and cylinder, RCVV linear actuating cylinders, DEEC, convergent exhaust nozzle control, and anti-icing valve.

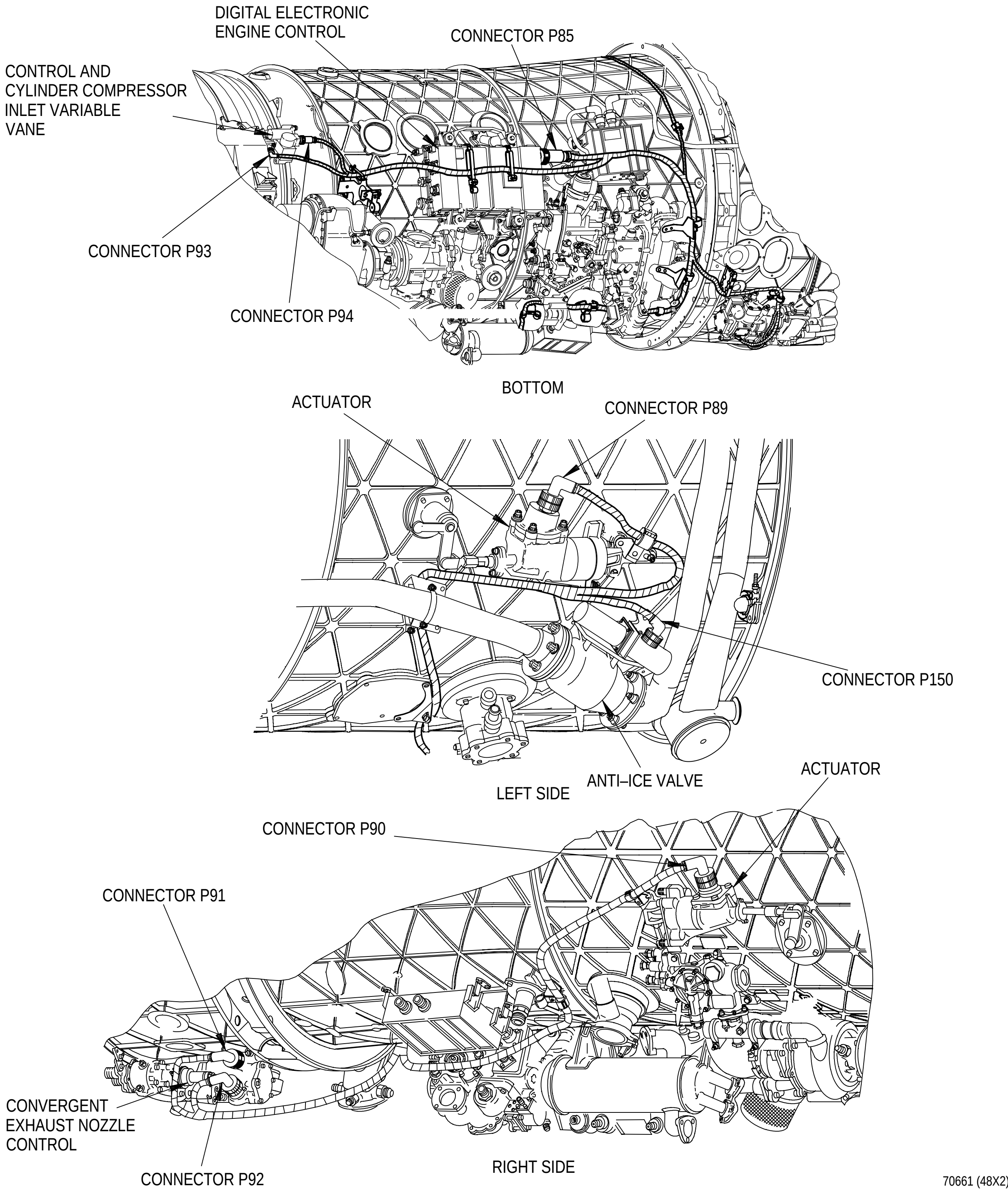


Figure 6. Engine Actuator Special Purpose Electrical Branched Cable - Removal

8. EDU GROUND INTERFACE SPECIAL PURPOSE ELECTRICAL BRANCHED CABLE (VIOLET) - REMOVAL.

(See Figure 7.)

a. Remove electrical cable ties as necessary to remove cable.

NOTE

Do not remove screw when disengaging upper half of hinged cushioned loop clamps. Turn screw while depressing spring until square nut aligns with square hole in clamp. Open clamp leaving screw and nut attached to upper half of clamp.

b. Disengage upper half of hinged cushioned loop clamps holding cable in place.

c. Remove cap from connector J-146.

d. Remove four screws and nuts securing connector J-146 to bracket on oil pump.

e. Remove two bolts securing thermocouple end of cable to anti-icing manifold.

f. Remove connector P-70 from engine diagnostic unit.

g. Remove cable ensuring not to bend cable to a radius of less than 5 inches.

h. Place protective closure on engine diagnostic unit receptacle.

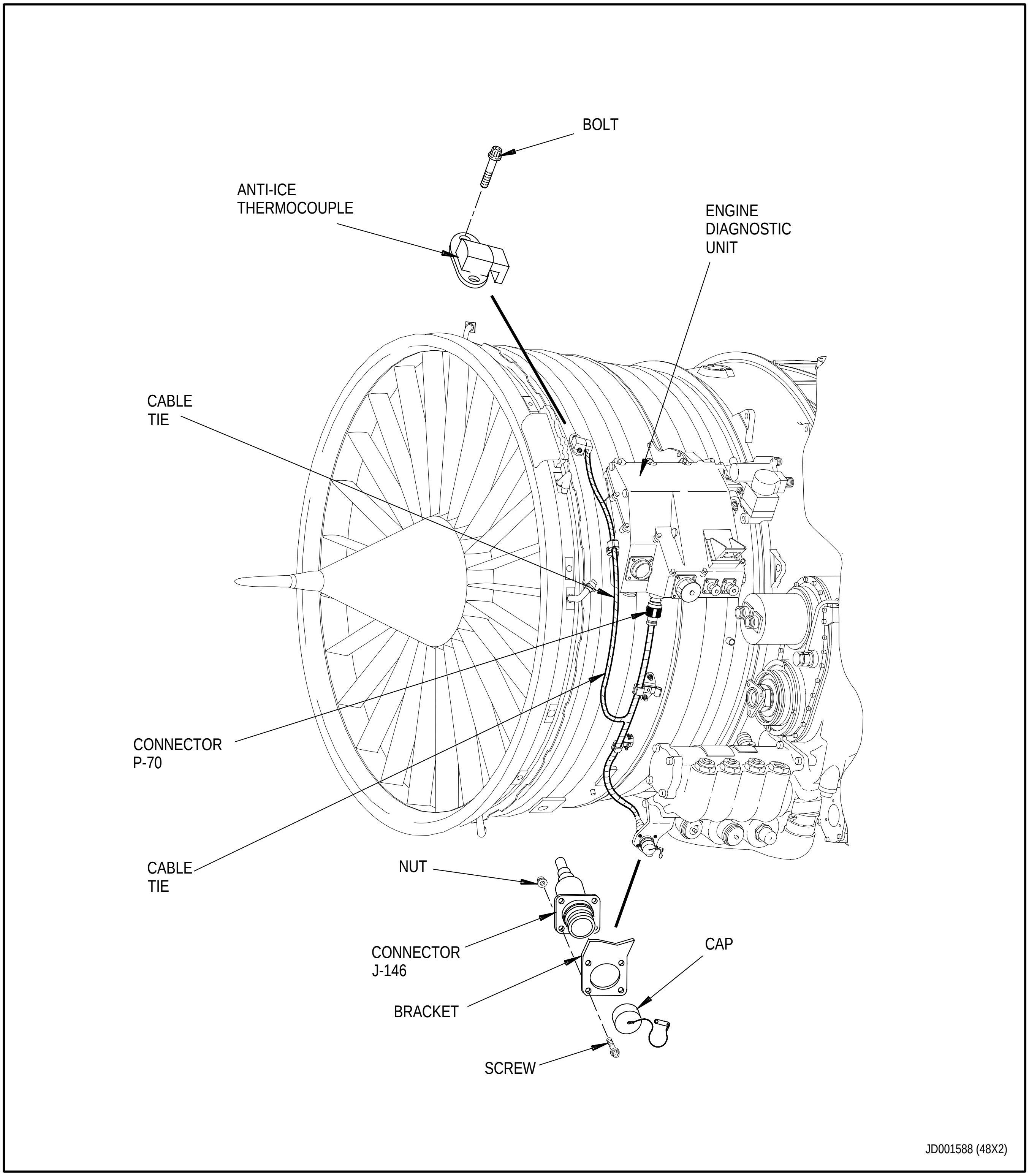


Figure 7. EDU Ground Interface Special Purpose Electrical Branched Cable - Removal

9. POWER AND SPEED SPECIAL PURPOSE ELECTRICAL BRANCHED CABLE (BLUE) - REMOVAL.

(See Figure 8.)

a. Remove electrical cable ties as necessary to remove cable.

NOTE

- Do not remove nut when disengaging upper half of block clamps. Loosen nut until upper half of block clamp slides freely.
- Do not remove screw when disengaging upper half of hinged cushioned loop clamps. Turn screw while depressing spring until square nut aligns with square hole in clamp. Open clamp leaving screw and nut attached to upper half of clamp.

b. Disengage upper half of hinged cushioned loop clamps and upper half of block clamps holding cable in place.

c. Remove nuts and bolts from loop clamps holding cable in place. Loosely install nuts, bolts and loop clamp onto connecting bracket.

d. Remove bolts from hinged clamps holding cable in place on DEEC. Loosely install bolts on clamps after cable is clear.

e. Remove four screws and nuts securing connector J-1 to bracket on engine diagnostic unit.

f. Remove four screws and nuts securing connector J-77 to bracket on main gearbox.

g. Remove cable connector clamp (after TCTO 2J-F100229-562). Disconnect connector P-118 from generator.

h. Disconnect connectors P-53, P-142, and P-143 from receptacles on fan inlet case.

i. Disconnect connectors P-50 and P-121 from engine diagnostic unit.

j. Disconnect connector P-82 from DEEC.

k. Disconnect connector P-112 from main fuel control.

l. Disconnect connector P-116 from augmentor light off detector.

m. Remove cable ensuring not to bend cable to a radius of less than 5 inches.

n. Place protective closures on engine diagnostic unit, augmentor light off detector, DEEC, generator, and receptacles on inlet fan case.

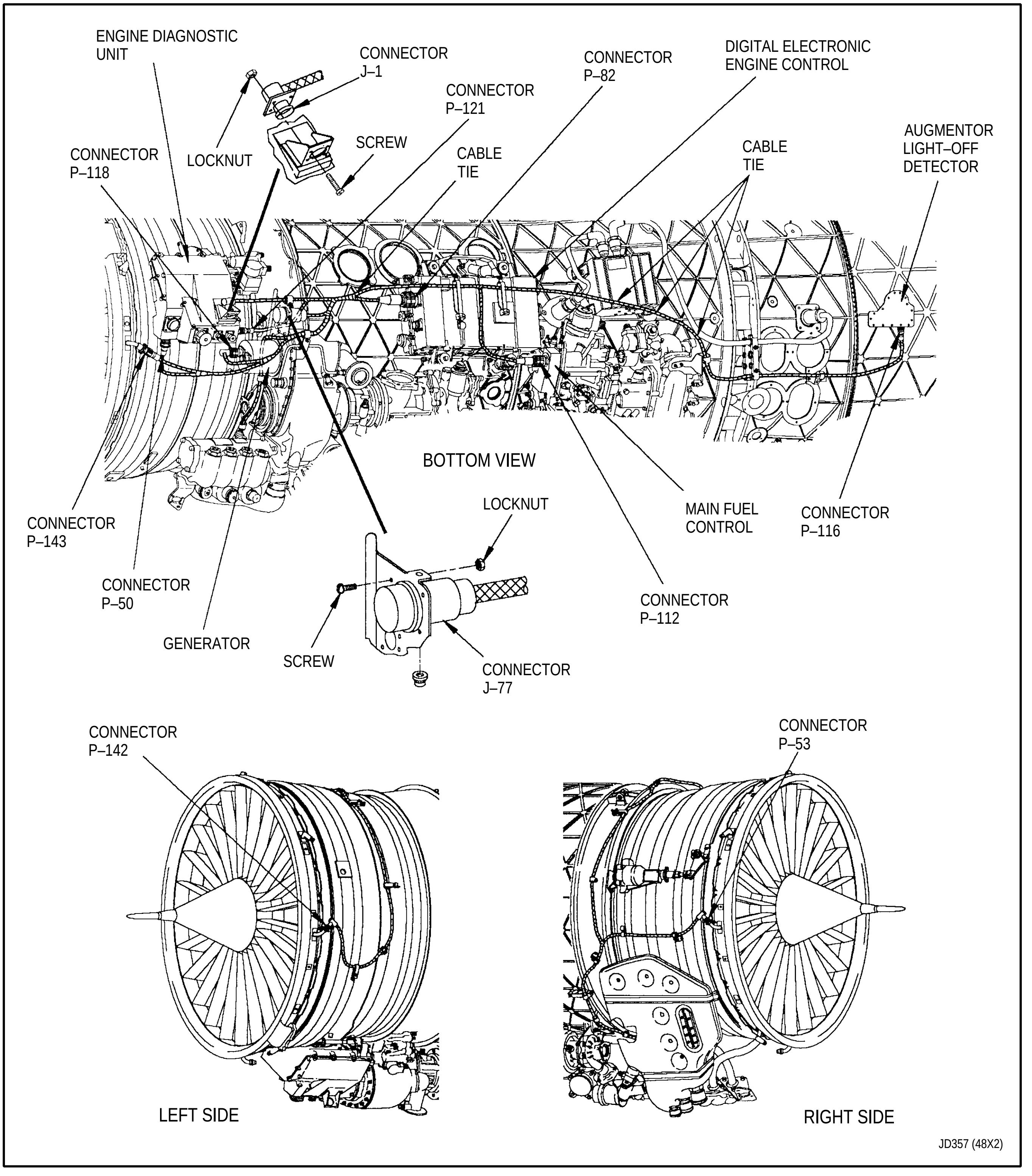


Figure 8. Power and Speed Special Purpose Electrical Branched Cable - Removal

10. DATA BUS ELECTRICAL BRANCHED DEEC OPTION A, 1553 CABLE (BLACK) - REMOVAL. (See Figure 9.)

a. Remove electrical cable ties as necessary to remove cable.

b. Remove screws and nuts securing connector J-171 to bracket on main gearbox.

c. Disconnect connectors P-87 and P-88 from DEEC.

d. Remove cable ensuring not to bend cable to a radius of less than 5 inches.

e. Place protective closures on DEEC receptacles.

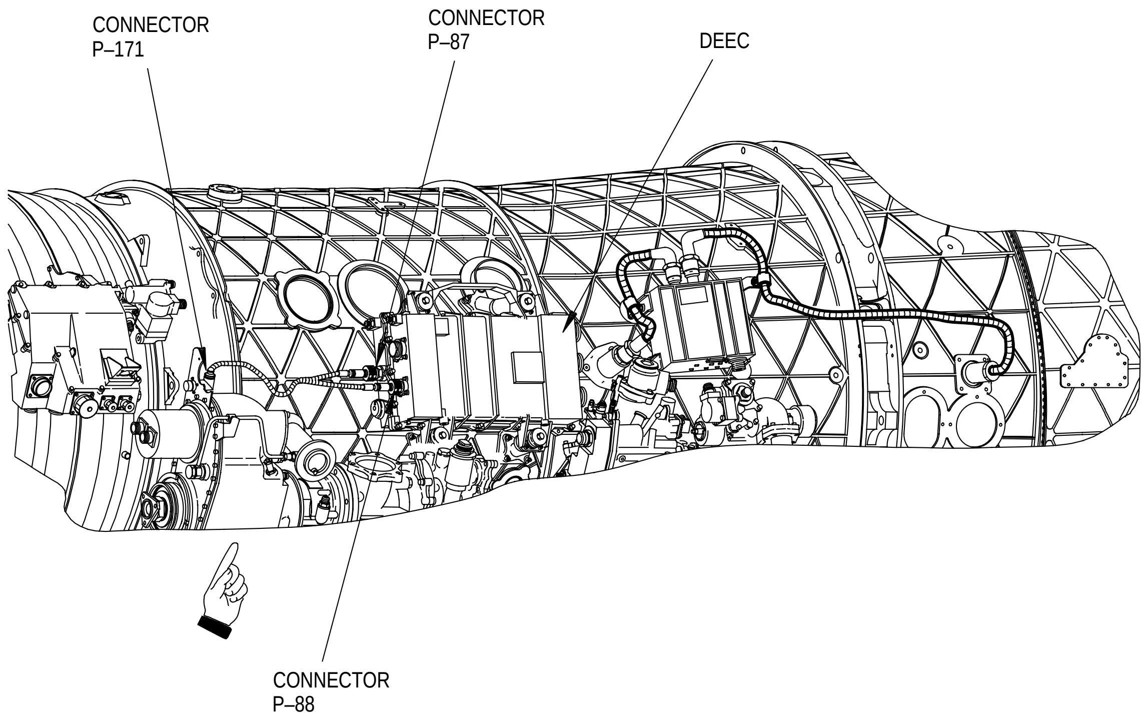


Figure 9. Data Bus Electrical Branched DEEC Option A, 1553 Cable - Removal

11. SPECIAL PURPOSE ELECTRICAL CABLES - CLEANING.

a. Moisten a clean cloth with P-D-680, Type II petroleum solvent, denatured alcohol conforming to O-E-760, Type III or Sparkleen cleaning fluid.

b. Do not bend cables to a radius of less than 5 inches to prevent possible breakage of conduit.

c. Clean cable connector bodies with moistened cloth. Remove stubborn spots or stains with stiff bristled, nonmetallic brush.

d. Clean outer braid of cable with denatured alcohol conforming to O-E-760, Type III or Sparkleen cleaning fluid. Using soft bristled, nonmetallic brush, scrub area until color can once again be identified, or area is considered clean. Dry with clean, compressed air at less than 30 psig.

e. Clean connector pins, sockets, and insulation with O-E-760, Type III alcohol, P-D-680, Type II petroleum solvent. Dry with clean, compressed air at less than 30 psig.

12. SPECIAL PURPOSE ELECTRICAL CABLES - INSPECTION.
(See Figure 10.)

a. Do not bend cables to a radius of less than 5 inches to prevent possible breakage of conduit.

b. Inspect cables. (See figure 10.)

c. Inspect FTIT cable connectors P38 through P44 as follows:

(1) Inspect for cracked or broken stem welds. Replace cable with damaged welds.

(2) Inspect probe caps for nicked, dented, or distorted caps. Replace cable if damage interferes with proper installation or fit of cap onto probe.

d. Inspect electrical connectors for bent pins. Refer to T.O. 2J-F100-53-1, WP 021 00.

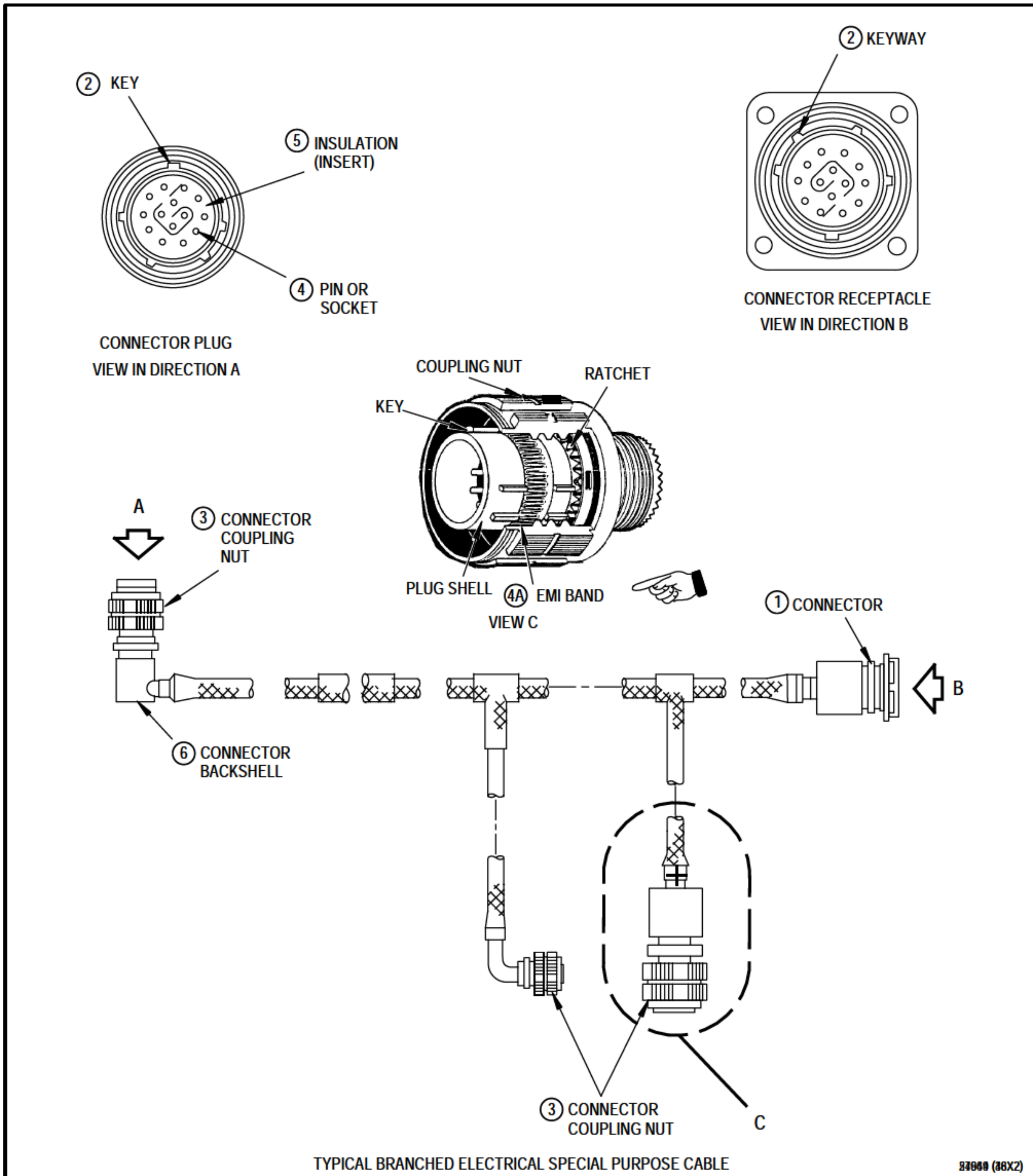


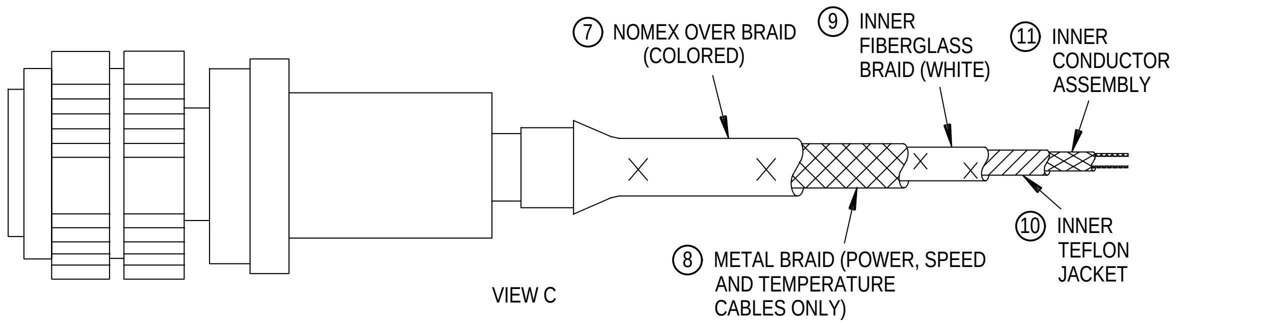
Figure 10. Special Purpose Electrical Cables - Inspection (Sheet 1 of 2)

Legend for figure 10

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1.Connector			
2.Key or keyway -			
Wear, burrs, or dented	Minor wear	Small burrs and raised edges	Repair. Refer to paragraph 13. Replace cable if damage exceeds reparable limits.
3.Connector coupling nut -			
Threaded areas broken, dented or crossed threads	Not serviceable	Not reparable	Replace cable.
Outer surface scored, nicked, or dented	No heavy scoring or mechanical damage that distorts connector or coupling nut	Not reparable	Replace cable.
		All other connectors not reparable	Replace cable.
Ratchet detents worn or inoperative	Minor wear. Ratchet detents must provide resistance when rotating coupling nut by hand.	Not reparable	Replace cable.

Legend for figure 10 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
4.Pin or socket -			
Worn or recessed	No broken or recessed sockets allowed	Not reparable	Replace cables which are unserviceable.
4A. EMI Band -			
Fractured or missing	Not serviceable	Reparable	Replace connector EMI Band per paragraph 13.
5.Insulation (Insert) -			
Nicks, gouges, missing areas	Minor nicks are acceptable	Not reparable	Replace cable.
6.Connector backshell -			
Nicks or dents	Any amount acceptable if without cracks or major backshell deformation	Not reparable	Replace cable.
7.Nomex over-braid -			
Frayed, worn through, burned, separated, stretched or cut.	No more than 22 broken strands per 0.500 inch cable length not to exceed 180 degrees of cable circumference. No more than three affected areas per foot.	Up to 2 inches in cable length.	Repair cable, refer to paragraph 13. Replace cable if damage exceeds reparable limits.
Discoloration	Any amount acceptable if cable’s original color can still be interpreted at any point along cable length.	Not reparable	Replace cable.



TYPICAL CONNECTOR/NOMEX CABLE CONFIGURATION

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
8. Metal braid -			
Frayed, worn through, burned, separated, stretched or cut.	No more than 32 broken strands per 0.500 inch cable length not to exceed 180 degrees of cable circumference. No more than three affected areas per foot.	Up to 2 inches in cable length.	Repair cable, refer to paragraph 13. Replace cable if damage exceeds reparable limits.
9. Inner fiberglass braid -			
Frayed, worn through, burned, separated, stretched or cut.	No more than 22 broken strands per 0.500 inch cable length not to exceed 180 degrees of cable circumference. No more than three affected areas per foot.	Up to 2 inches in cable length.	Repair cable, refer to paragraph 13. Replace cable if damage exceeds reparable limits.
10. Inner teflon jacket -	No inner jacket damage allowed	Not reparable	Replace cable.
11. Inner conductor assembly -	No inner conductor damage allowed	Not reparable	Replace cable.

Figure 10. Special Purpose Electrical Cables - Inspection (Sheet 2 of 2)

13. SPECIAL PURPOSE ELECTRICAL CABLES AND CONNECTOR - REPAIR
(See Figures 11 and 11A, Tables 1 and 2.)

a. Connectors with minor surface damage to keyways or threads may be repaired using small pattern file or thread file.

b. Clean cables, connector pins and sockets. Refer to paragraph 11.

c. Repair Nomex cable over-braid using Nomex gray yarn as follows (see figure 11, sheets 1 through 7):

(1) Thread Nomex gray yarn SPES PN 156416-0008 through needle FF-N-180, or equivalent.

(2) Being careful not to damage cable teflon jackets, feed needle under 3 to 5 strands of the outer braid approximately 1/4 to 1/2 inch beyond the damaged area. Remove needle from yarn.

(3) Using a knot (see sheet 1), secure the yarn and trim loose end at a point 1/4 inch beyond damaged area. Loose end may be held in place with tape during initial wraps.

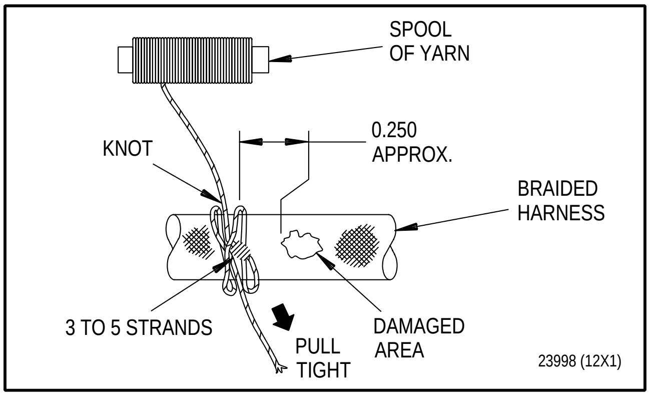


Figure 11. Nomex cable over-braid - Repair (Sheet 1 of 7)

(4) On undamaged side of the knot, begin wrapping yarn tightly around harness covering knot and remove tape prior to reaching yarn end. See sheet 2.

(5) Making sure subsequent windings are tightly wound and in contact with each other, continue winding yarn 1/4 to 1/2 inch beyond damaged area. Ensure loose end from step (3) is covered.

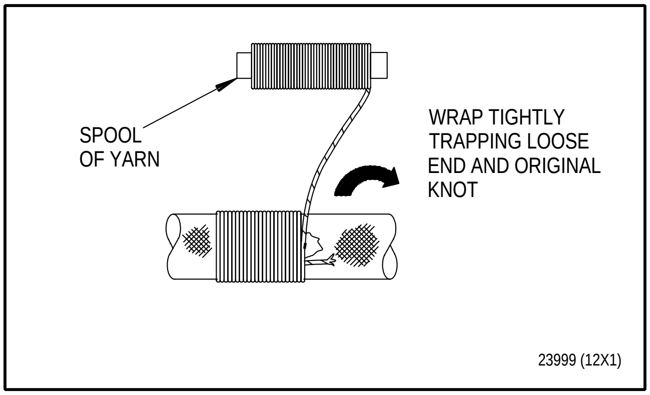


Figure 11. Nomex cable over-braid - Repair (Sheet 2 of 7)

(6) Trim yarn to leave approximately a 24 inch thread length. Rethread needle and feed under 3 to 5 strands of braid, just past wrapped area. See sheet 3.

(7) Secure yarn by tying a knot per sheet 3 and trim yarn leaving a tail of approximately 1 to 3 inches.

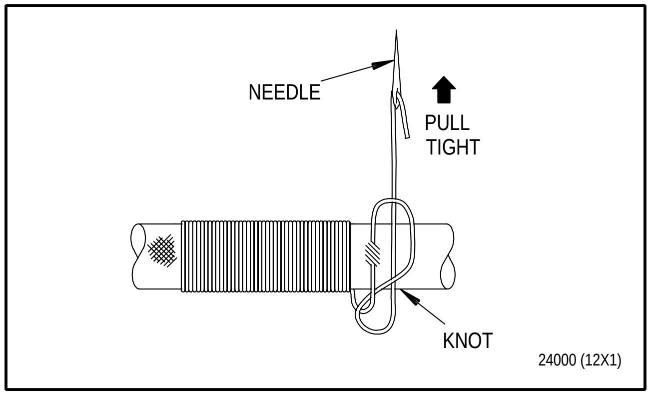


Figure 11. Nomex cable over-braid - Repair (Sheet 3 of 7)

(8) With a new end from spool of yarn, repeat step (1). Rethread needle. Being careful of cable teflon jackets, feed needle under 3 to 5 strands of over-braid just past (to right) of first wrapped layer. See sheet 4.

(9) Using a knot (see sheet 4), secure the yarn and lay loose end of yarn with loose end of first layer back across first layer. See sheet 5.

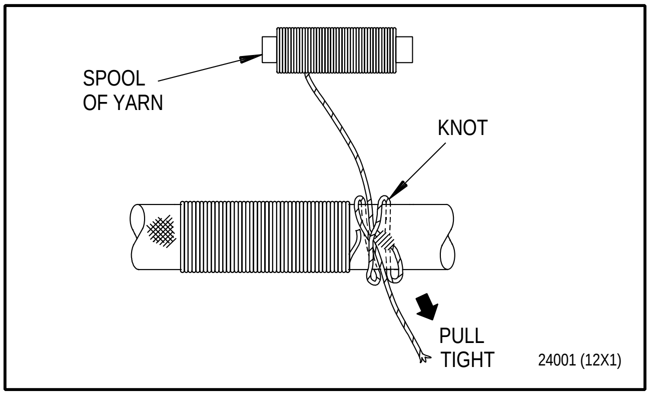


Figure 11. Nomex cable over-braid - Repair (Sheet 4 of 7)

(10) Begin wrapping yarn tightly around harness covering the knots, any loose ends and the first layer. Loose ends may be secured with tape during initial wraps. Trim both loose ends so that they do not cover more than one half the patched area.

(11) Making sure subsequent windings are tightly wound and in contact with each other, continue winding until all of first layer is covered. Remove tape when appropriate, covering loose end with wraps. Wrap approximately 1/4 inch beyond beginning of first layer.

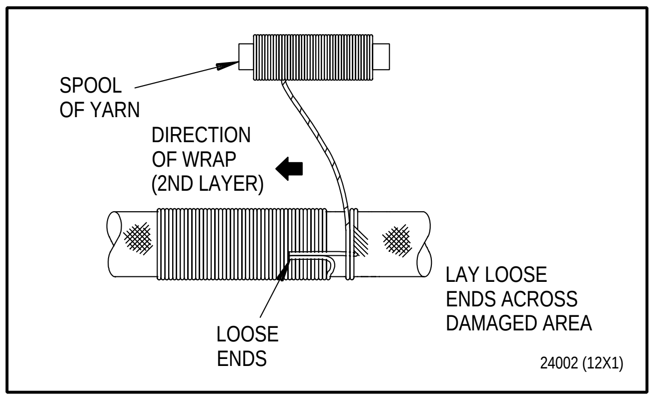


Figure 11. Nomex cable over-braid - Repair (Sheet 5 of 7)

(12) Trim yarn to leave approximately a 24 inch thread length. Rethread needle and feed under 3 to 5 strands of braid on base parent material. See sheet 6.

(13) Tie knot to secure yarn. See sheet 6.

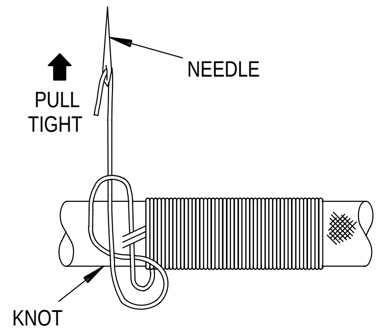


Figure 11. Nomex cable over-braid - Repair (Sheet 6 of 7)

(14) Loop thread and feed under 3 to 10 strands of patch layer. See sheet 7.

(15) Pull thread tight and trim flush with patch layer. See sheet 7.

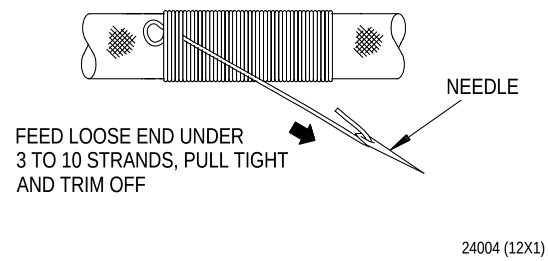


Figure 11. Nomex cable over-braid - Repair (Sheet 7 of 7)

d. Electro-Magnetic Interference (EMI) band repair as follows: (See Figure 11A and Tables 1 and 2.)

(1) Determine EMI band supplier by blue identification band on connector plug and "P" number marked on connector back shell.

NOTE

- Same type connector must be used, NO interchange allowed between Bendix and Pyle EMI bands.
- Matrix connectors must be repaired by supplier.

(2) Select EMI band part number for corresponding location and supplier by consulting Table 1.

(3) EMI Band assembly as follows: (See figure 11A and Table 2.)

(a) Examine front of plug connector assembly using bright light and optional 7 to 10X magnifying glass. Remove all broken pieces of damaged EMI band with needle nose tweezers or dental probe and discard.

Table 1. Connector Shell Size to EMI Band Selection Guide

Connectors	Shell Size	ØA (ref) (Fig 11A, Sht 4)	EMI Band Part Numbers	
			Bendix	Pyle
P-110,	09	0.433	149383-1009	149383-2009
P-89, P-90, P-91 P-92, P-93, P-94, P-97, P-98, P-100, P-102, P-108, P-111, P-149, P-150	11	0.561	149383-1011	149383-2011
P-99, P-101, P-103, P-107, P-109, P-116	13	0.673	149383-1013	149383-2013
P-53, P-87*, P-88*, P-112, P-118, P-121, P-142, P-143	15	0.798	149383-1015	149383-2015
P-81, P-104, P-113	17	0.923	149383-1017	149383-2017
P-70, P-119	19	1.028	149383-1019	149383-2019
P-83, P-85	23	1.278	149383-1023	149383-2023
P-82, P-84	25	1.403	149383-1025	149383-2025
* F100-PW-229 Unique connector location				

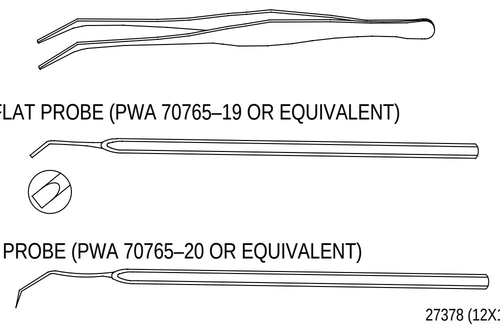


Figure 11A. EMI Band - Repair (Sheet 1 of 4)

NOTE

- Do not clean area with any type of solvent.
- Inspect mating receptacle for any traces of EMI band fragments.

(b) Select correct expander cone assembly tool and pusher sleeve tool from Table 2. Install PWA 70765-17 handle on expander cone assembly tool (see figure 11A, sheet 2).

Table 1A. EMI Band Repair (PWA 70765 Assembly Tools)

Shell Size	Expander Cone Assembly Tool	ØB	Pusher Sleeve Tool	ØC
09 (A)	PWA 70765-1	0.484	PWA 70765-2	0.506
11 (B)	PWA 70765-3	0.612	PWA 70765-4	0.628
13 (C)	PWA 70765-5	0.761	PWA 70765-6	0.787
15 (D)	PWA 70765-7	0.886	PWA 70765-8	0.902
17 (E)	PWA 70765-9	1.011	PWA 70765-10	1.027
19 (F)	PWA 70765-11	1.116	PWA 70765-12	1.131
23 (H)	PWA 70765-13	1.366	PWA 70765-14	1.382
25 (J)	PWA 70765-15	1.491	PWA 70765-16	1.507

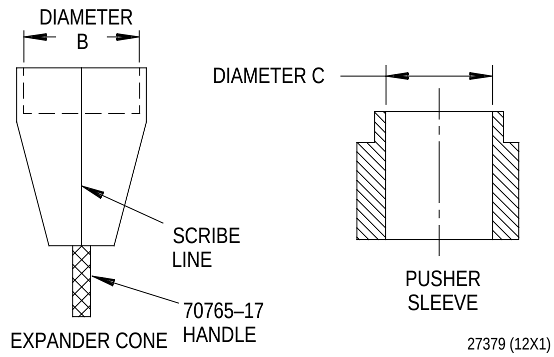


Figure 11A. EMI Band - Repair (Sheet 2 of 4)

CAUTION

Pusher sleeves, expander cones and EMI bands are EXTREMELY FRAGILE. Care must be taken not to damage tools or bands.

(c) Inspect EMI band to ensure that tines (see figure 11A, sheet 3) have not been distorted or bent.

(d) Locate spotwelded tine, (see figure 11A, sheet 3) if not supplied with marking, mark with felt marking pen of contrasting color.

(e) Set expander cone assembly tool on clean, dry, flat surface. Orient EMI band, hooks end up, align spotwelded tine with stripe on expander cone assembly tool and slide over tapered end of tool (see figure 11A, sheet 3).

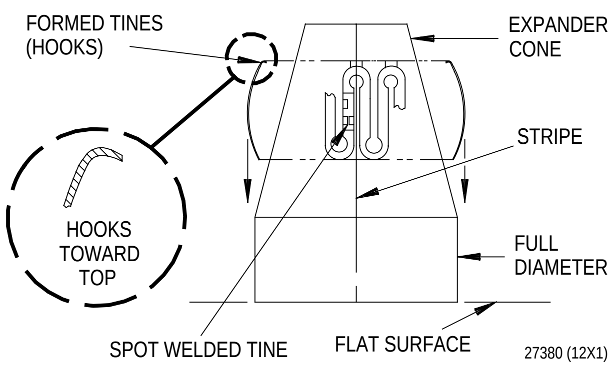


Figure 11A. EMI Band - Repair (Sheet 3 of 4)

CAUTION

- Care must be taken to ensure that force is distributed evenly.
- Failure to ensure that all spring fingers are expanded as uniformly as possible may result in damaged EMI band.
- Do not leave band on full diameter of expander cone assembly tool for an extended period of time.

(f) Using two hands, gently push band onto expander cone assembly tool. Push band over taper of tool until band sits on full diameter (flat) of tool.

NOTE

Care must be taken to align tine spotweld with main key before assembling onto connector, visual correction or inspection is not feasible after assembly.

(g) Position large end of cone assembly tool over keys of connector, aligning stripe of taper with tine spotweld of band with main key (widest key) on connector. Slide cone assembly tool down until it bottoms out.

(h) Position narrow end of pusher sleeve tool over cone assembly tool, slide sleeve down to full diameter of cone assembly tool.

(i) Continue pushing EMI band until sleeve bottoms against coupling nut.

(j) Pull expander cone assembly tool out of inside of pusher sleeve tool, remove sleeve. Do not rotate expander cone assembly tool.

NOTE

Ensure EMI band tines are completely seated into connector shell outside diameter anchoring groove prior to mating with connector receptacle.

(k) When EMI band is off expander cone assembly tool and in shell, it may be beyond anchoring groove. With dental probe relocate band to anchoring groove by gently pulling it towards front of connector plug (see figure 11A, sheet 4).

(l) With flat probe, start at spotweld and gently work around connector until all tines are "seated" downward and in place within anchoring groove of plug body.

(m) Visually inspect for complete seating of all tines (see figure 11A, sheet 4).

(n) Mate and unmate connector with mating receptacle a minimum of three times to test and "seat" EMI band.

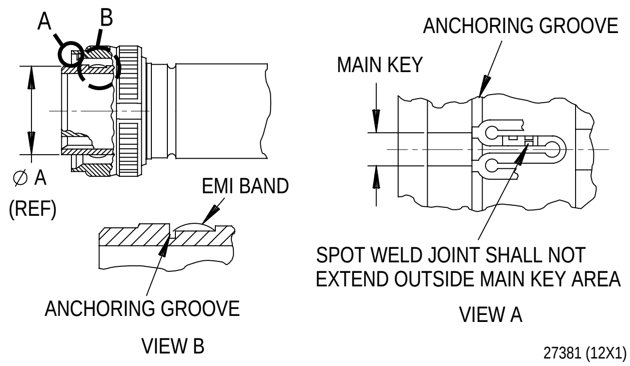


Figure 11A. EMI Band - Repair (Sheet 4 of 4)

14. SPECIAL PURPOSE ELECTRICAL CABLES - TESTING.
(See Figures 12 through 20, FO-1 and Table 3.)

a. Test conditions.

(1) Testing is to be done by qualified electronics technicians only.

(2) Test area shall be free from dirt, dust, and moisture.

(3) All connector contacts shall be thoroughly cleaned to prevent incorrect readings. Refer to paragraph 11.

b. Test procedure.

(1) Ensure tip of ohmmeter probe touches only end of desired pin in cable connector or optional PWA 56042 cable test set during test. Do not attempt to touch side of pin or optional PWA 56042 cable test set with probe. Shorting or wrong ohmmeter reading can occur if probe comes in contact with adjacent pin or body of connector.

(2) Using PSM-6 ohmmeter, or equivalent, and optional PWA 56042 cable test set check continuity between connectors of each electrical cable. (See table 3.) Refer to the schematic and resistance check figure, as applicable, of each cable being tested. (See figures 12 through 20 and FO-1.)

(3) Check to assure there are no shorts between circuits, or from circuit to connector shell.

(4) If discontinuity (open), shorts, are obtained, replace cable.

(5) Cable shall be at room temperature, 65° to 85°F (18° to 29°C).

Table 2. Special Purpose Electrical Cables - Testing

Cable	PN	Test Summary	Figure Reference
Thermocouple branched electrical special purpose cable	4077010	Measure thermocouple wire resistance.	12 13
Engine accessories branched electrical special purpose cable	4080477	Continuity test of circuits between connectors P-51, P-7, P-8, and P-149.	14
Ignition branched electrical special purpose cable	4071837	Continuity test of circuits between connectors P-118, P-26L, P-26R, P-104, and P-113.	15
Gas generator branched electrical special purpose cable	4071839	Continuity test of circuits between connectors P-83, P-107, P-108, P-109, P-110, and P-111.	16
Augmentor fuel control branched electrical special purpose cable	4071840	Continuity test of circuits between connectors P-84, P-97, P-98, P-99, P-100, P-101, P-102, and P-103.	17
Engine actuator branched electrical special purpose cable	4081242	Continuity test of circuits between connectors P-85, P-89, P-90, P-91, P-92, P-93, P-94, and P-150.	18
Engine diagnostic unit electrical special purpose cable	4071841	Continuity test of circuits between connectors P-70 and P-146.	19
Power supply and speed branched electrical special purpose cable	4077009	Continuity test of circuits between connectors P-82, P-50, P-53, P-112, P-116, P-118, P-121, P-142, P-143, J-1, and J-77.	FO-1
DEEC electrical special purpose cable	4071842 or 4078363		20

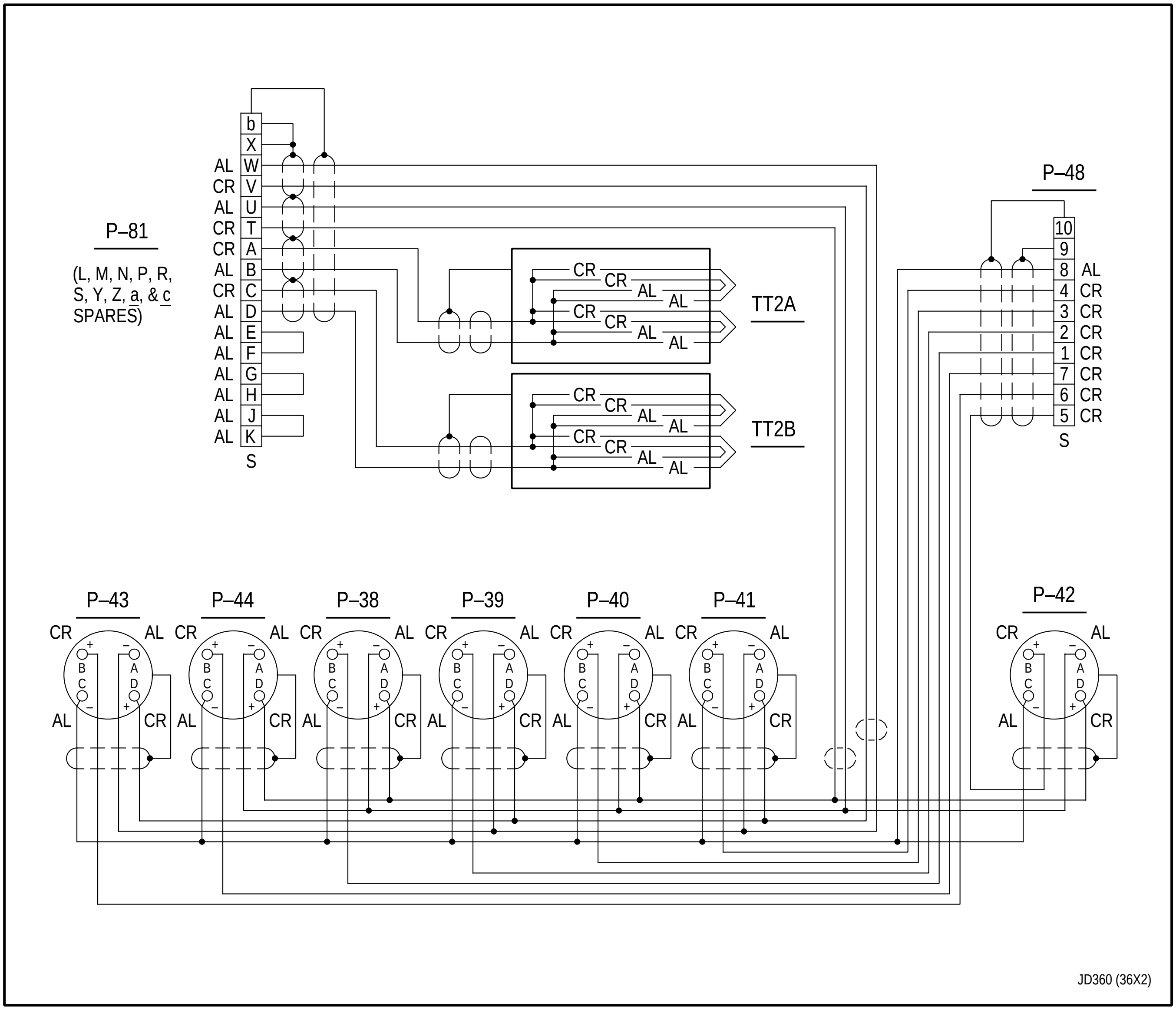


Figure 12. Thermocouple, Special Purpose Electrical, Branched Cable - Schematic

FROM		TO		RESISTANCE IN OHMS
CONNECTOR	CONTACT	CONNECTOR	CONTACT	
P-81	B	P-36	1	1.3 TO 1.7
P-81	A	P-36	2	3.2 TO 4.0
P-81	D	P-37	1	1.3 TO 1.7
P-81	C	P-37	2	3.2 TO 4.0
P-81	W	P-39	A	3.5 TO 4.4
P-81	W	P-41	A	3.5 TO 4.4
P-81	W	P-43	A	3.5 TO 4.4
P-81	V	P-39	D	8.4 TO 10.5
P-81	V	P-41	D	8.4 TO 10.5
P-81	V	P-43	D	8.4 TO 10.5
P-81	U	P-38	A	3.5 TO 4.4
P-81	U	P-40	A	3.5 TO 4.4
P-81	U	P-42	A	3.5 TO 4.4
P-81	U	P-44	A	3.5 TO 4.4
P-81	T	P-38	D	8.4 TO 10.5
P-81	T	P-40	D	8.4 TO 10.5
P-81	T	P-44	D	8.4 TO 10.5
P-81	T	P-44	D	8.4 TO 10.5
P-48	1	P-38	B	8.5 TO 10.6
P-48	2	P-39	D	8.5 TO 10.6
P-48	3	P-40	B	8.5 TO 10.6
P-48	4	P-41	B	8.5 TO 10.6
P-48	5	P-42	B	8.5 TO 10.6
P-48	6	P-43	B	8.5 TO 10.6
P-48	7	P-44	B	8.5 TO 10.6
P-48	8	P-38	C	3.8 TO 4.6
P-48	8	P-39	C	3.8 TO 4.6
P-48	8	P-40	C	3.8 TO 4.6
P-48	8	P-41	C	3.8 TO 4.6
P-48	8	P-42	C	3.8 TO 4.6
P-48	8	P-43	C	3.8 TO 4.6
P-48	8	P-44	C	3.8 TO 4.6

Figure 13. Thermocouple, Special Purpose Electrical, Branched Cable - Resistance Check

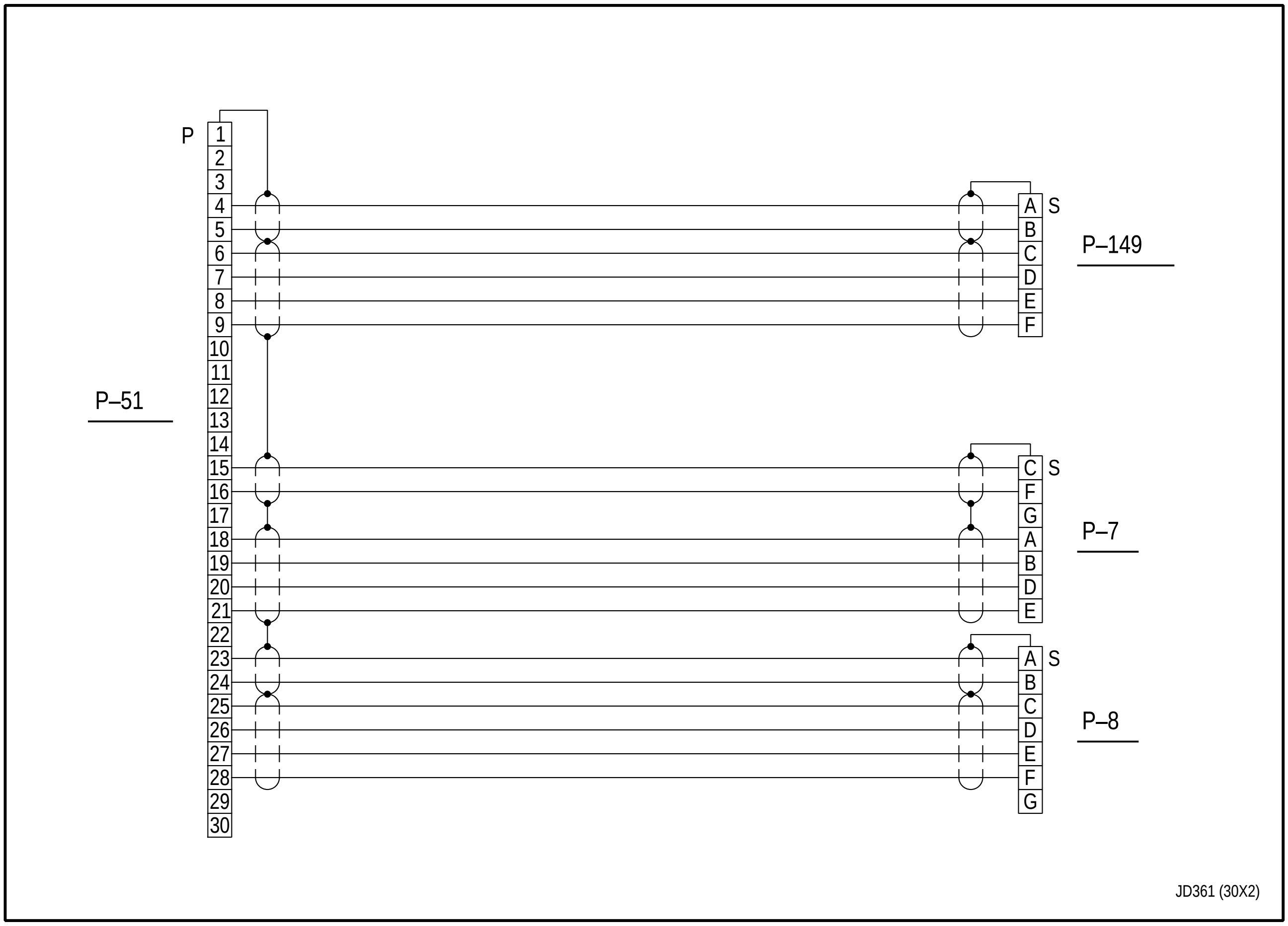


Figure 14. Engine Accessories, Special Purpose Electrical, Branched Cable - Schematic

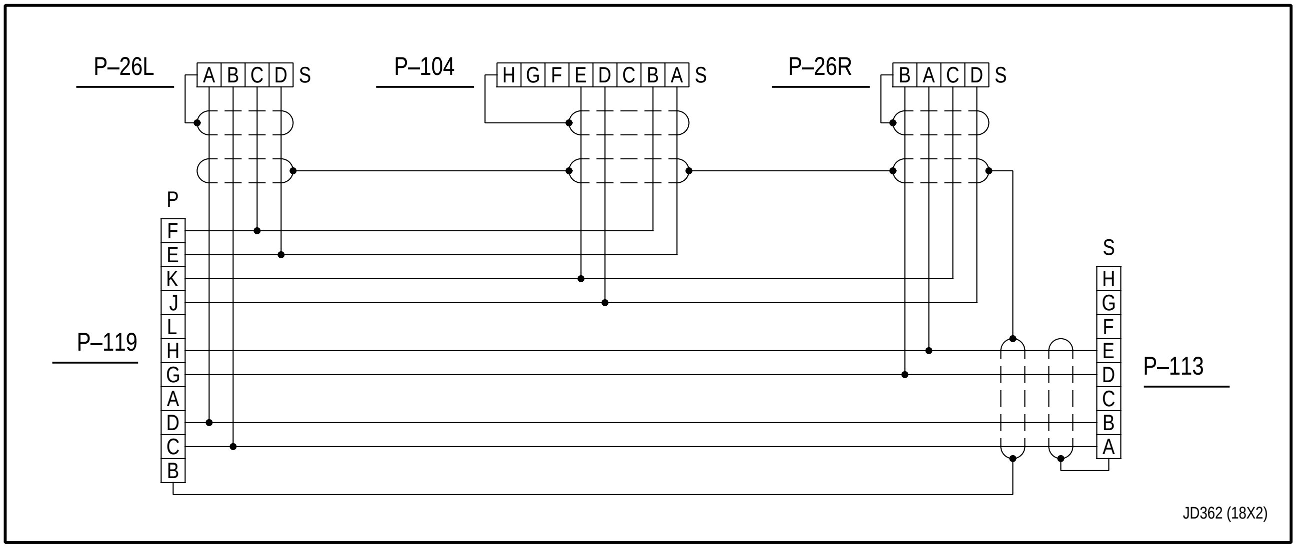


Figure 15. Ignition, Special Purpose Electrical, Branched Cable - Schematic

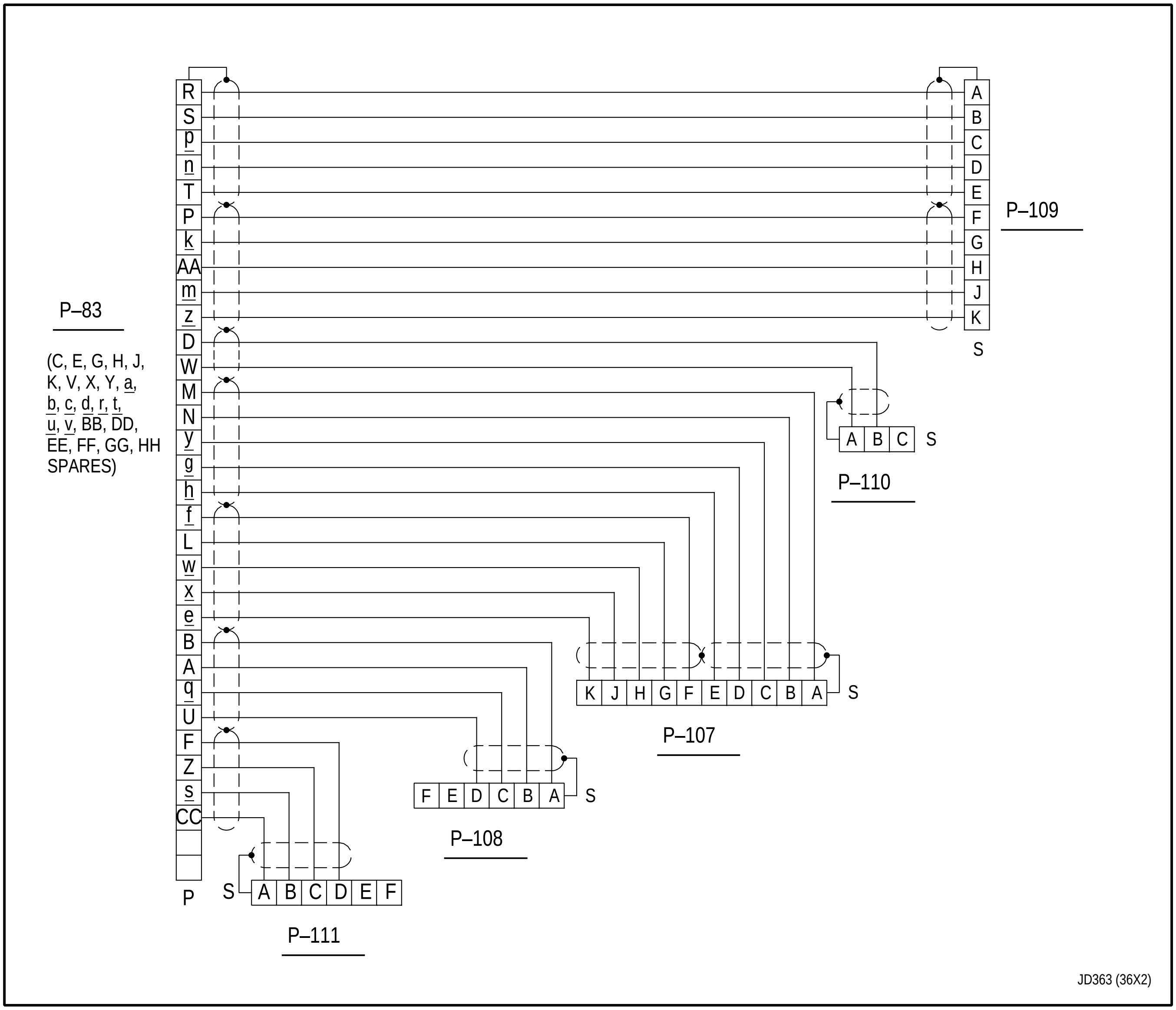


Figure 16. Gas Generator Control, Special Purpose Electrical Branched Cable - Schematic

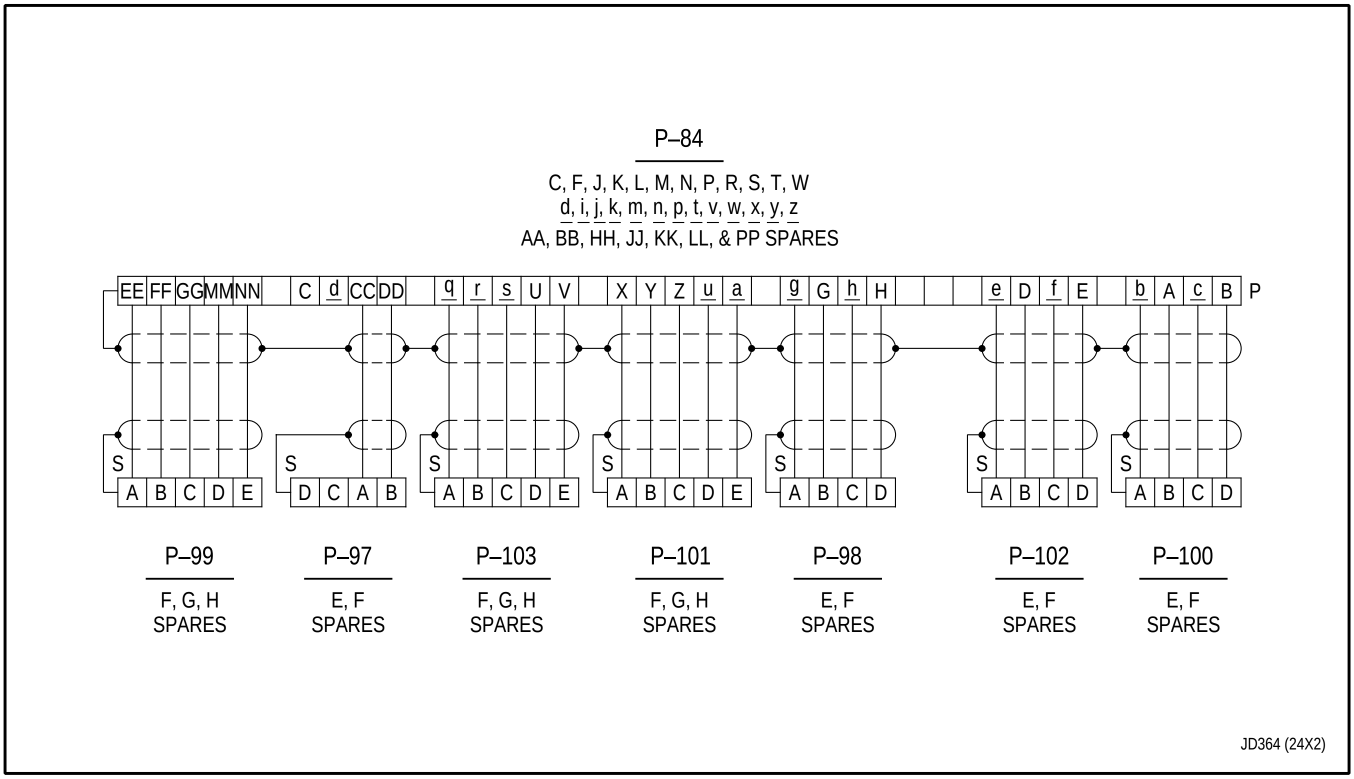


Figure 17. Augmentor Fuel Management, Special Purpose Electrical, Branched Cable - Schematic

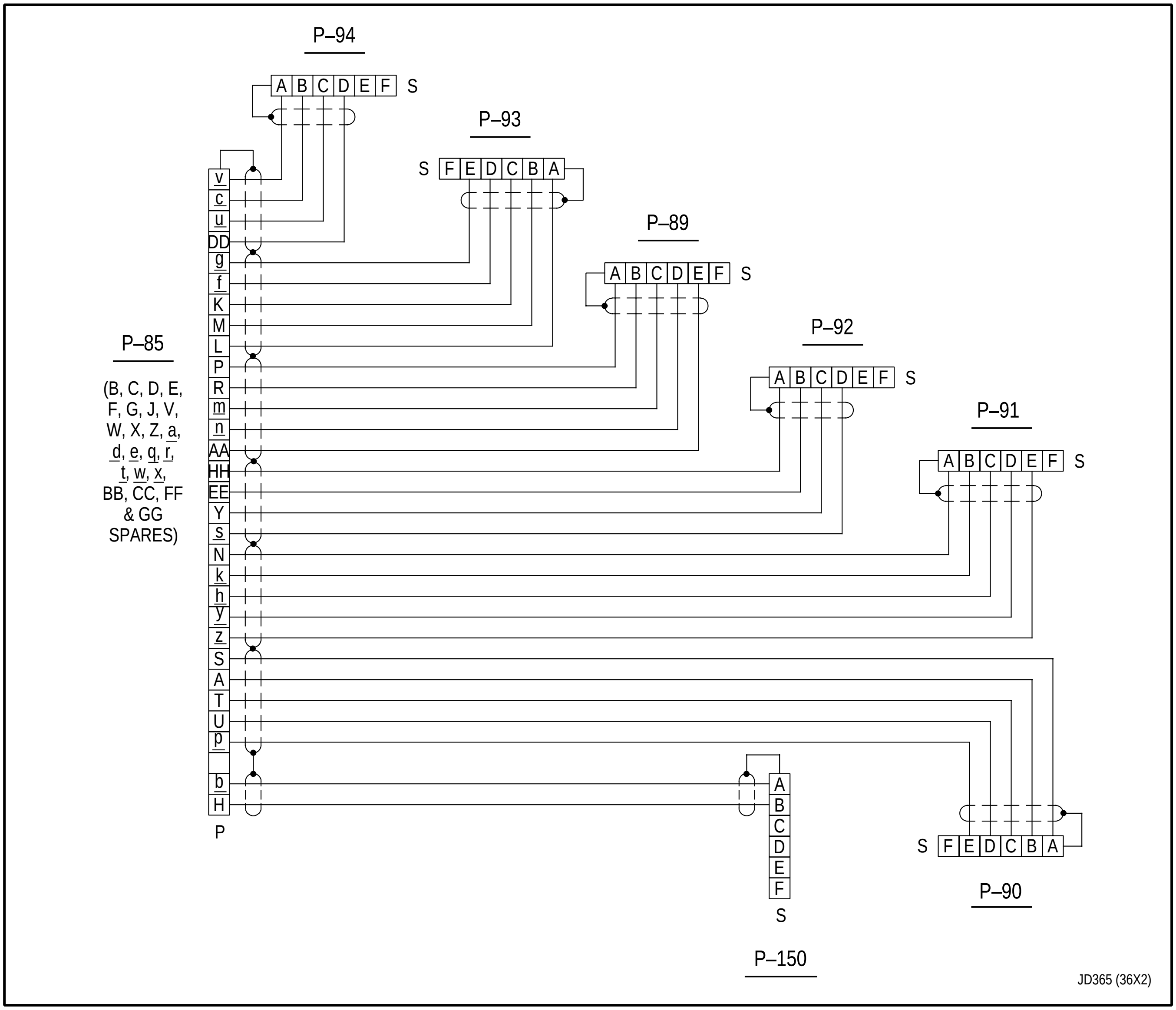


Figure 18. Engine Actuator, Special Purpose Electrical Branched Cable - Schematic

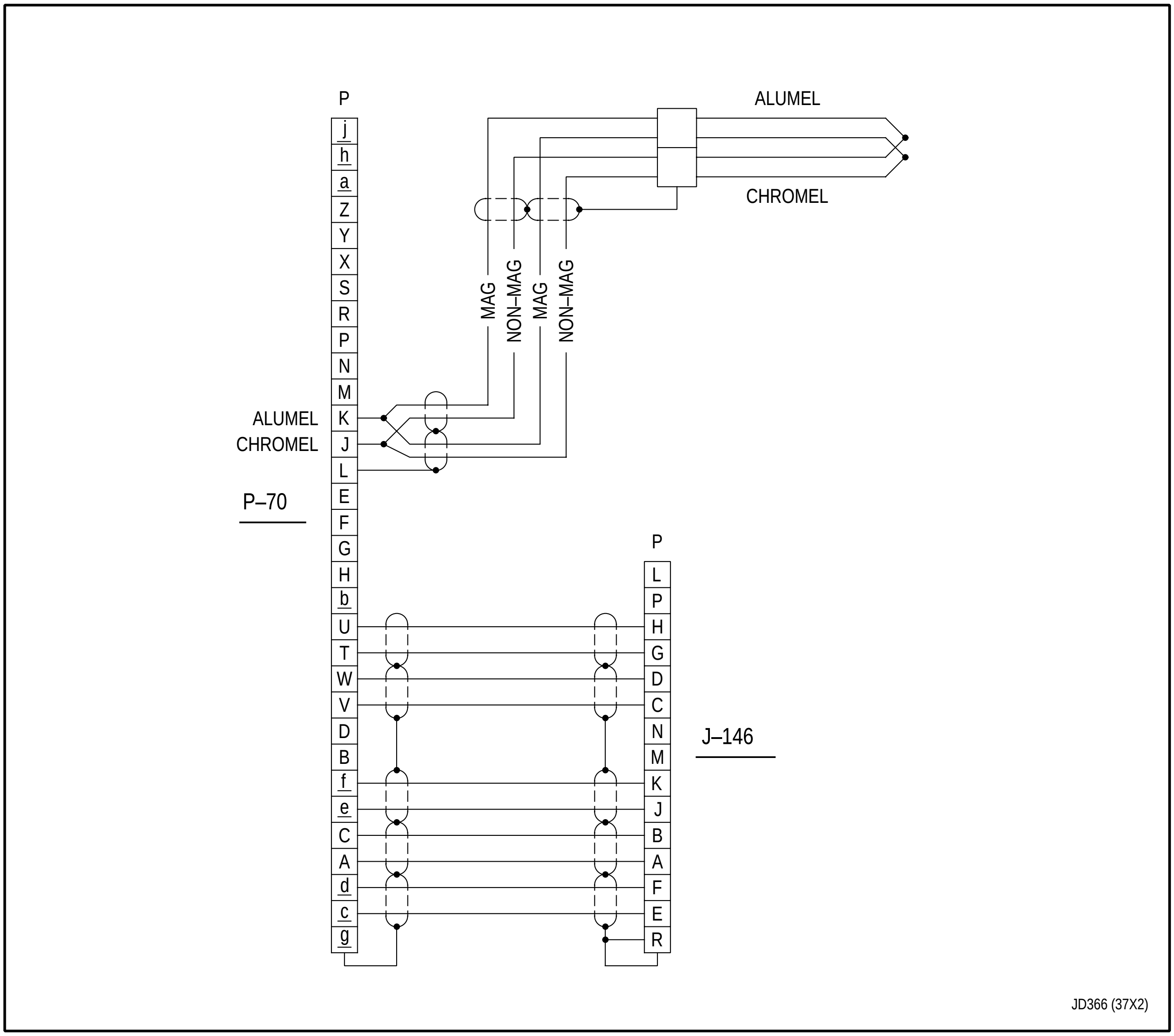


Figure 19. EDU Ground Interface, Special Purpose Electrical Branched Cable - Schematic

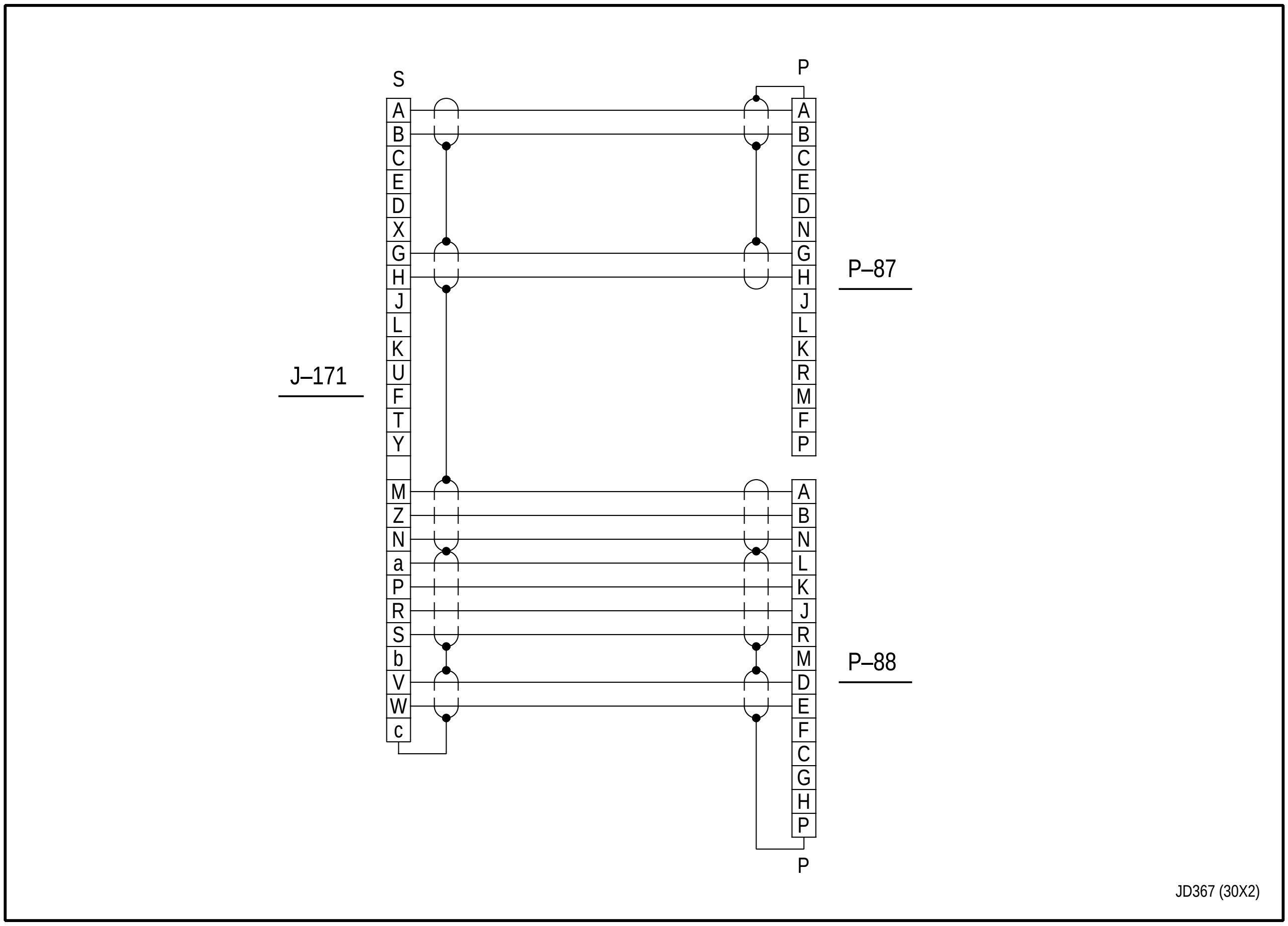
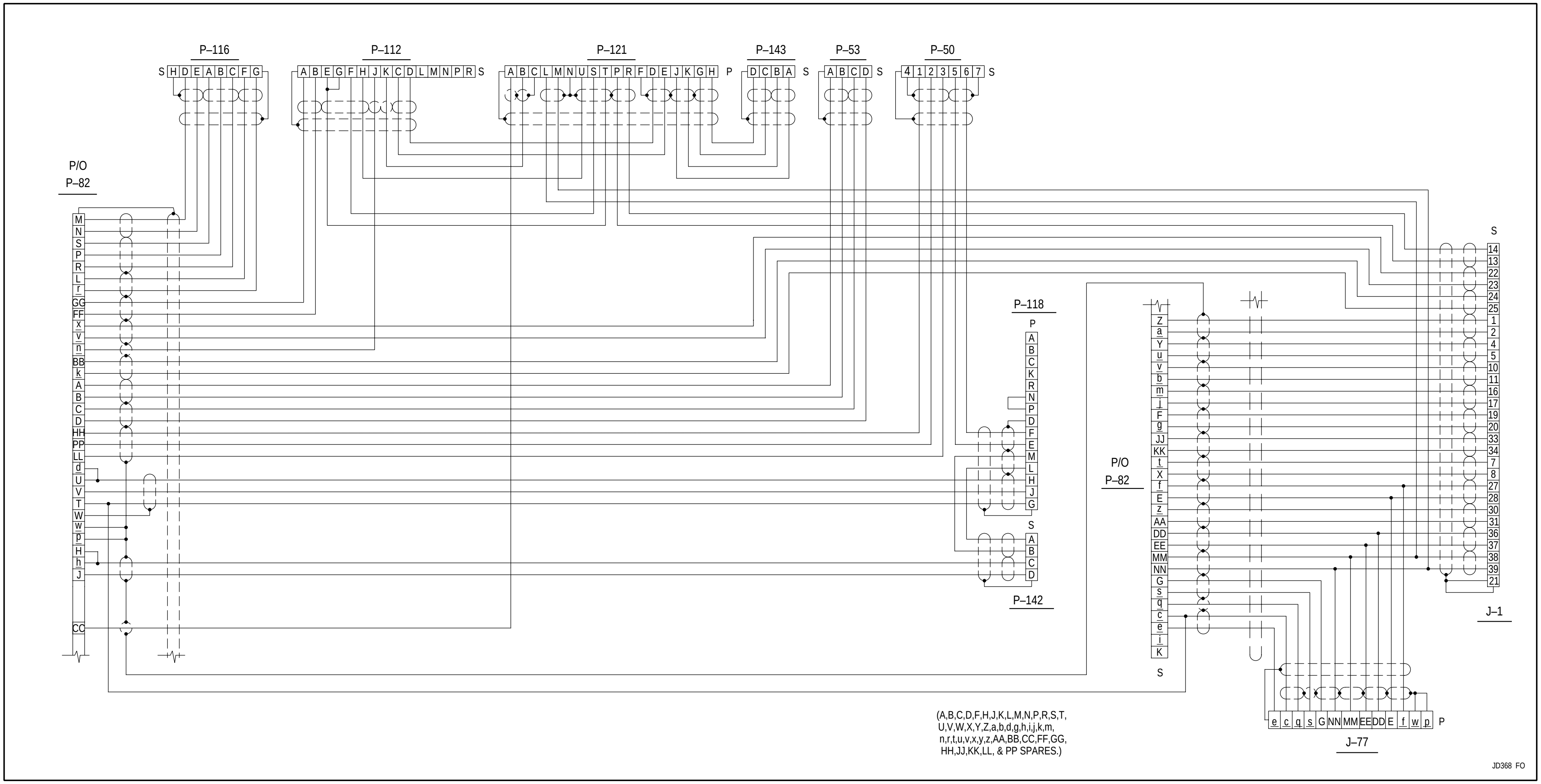


Figure 20. Data Bus Electrical, Branched DEEC Option A, 1553 Cable - Schematic



FO-1. Power Supply and Speed Sensing Branched Electrical Special Purpose Cable - Schematic

15. THERMOCOUPLE SPECIAL PURPOSE ELECTRICAL BRANCHED CABLE (RED) - INSTALLATION.
(See Figure 21.)

NOTE

If necessary, refer to T.O. 2J-F100-53-5, WP 064 00 for detailed cable clamping of all engine configurations.

a. Avoid sharp bends, twist, or kinks that may cause breakage of cable braid and wires.

b. Install thermocouple special purpose electrical branched cable on engine using clamps and hardware that is loosely installed on connecting brackets or engine case. Put a light coat of PWA 550 antigalling compound on threads of bolts. Tighten bolts fingertight. (See figure 21.)

c. Put a light coat of VV-P-236 petrolatum, on seven PN MS9386-122 packings. Remove excess petrolatum from packings.

d. Remove protective closures from FTIT sensing immersion thermocouples in rear fan duct. Install packing in groove of each thermocouple.

e. Remove any petrolatum from contacts of thermocouples.

f. Install cable connectors P38 through P44 to thermocouples as follows:

(1) Inspect cable cap bolt threads for damage and debris. Replace/clean as required.

(2) Apply PWA 550 anti-galling compound to cable cap bolt threads if none is present.

CAUTION

Ensure there is no anti-gallant on contacts of thermocouples or cable probe caps. To avoid electrical short circuit.

(3) Install cable cap bolts fingertight until bolts bottom on cable cap. If bolts bind, remove bolts and chase insert threads using 10-32-UNJF-3B tap. Clean threads as required.

(4) Reinstall cable cap bolts fingertight until bolts bottom on cable cap. Torque bolts 10 to 15 pound-inches. Lockwire with MS9226-04 wire.

g. Remove protective closures from receptacles of Tt2 sensing immersion thermocouples on inlet fan case; receptacle J-48 on engine diagnostic unit and receptacle J-81 on DEEC.

h. Connect following cable connectors to receptacles by aligning keyways and handtightening connector. Ensure red line on receptacle is not visible when viewed at right angles. Tighten connector firmly with soft-jawed pliers.

(1) Connector P-48 to receptacle J-48 of engine diagnostic unit.

(2) Connector P-81 to receptacle J-81 of DEEC.

NOTE

Tie-wraps are not to be used to constrain cables/harnesses to tubes, hard mounts, or electrical connectors.

i. Install ST2625-03 electrical cable ties.

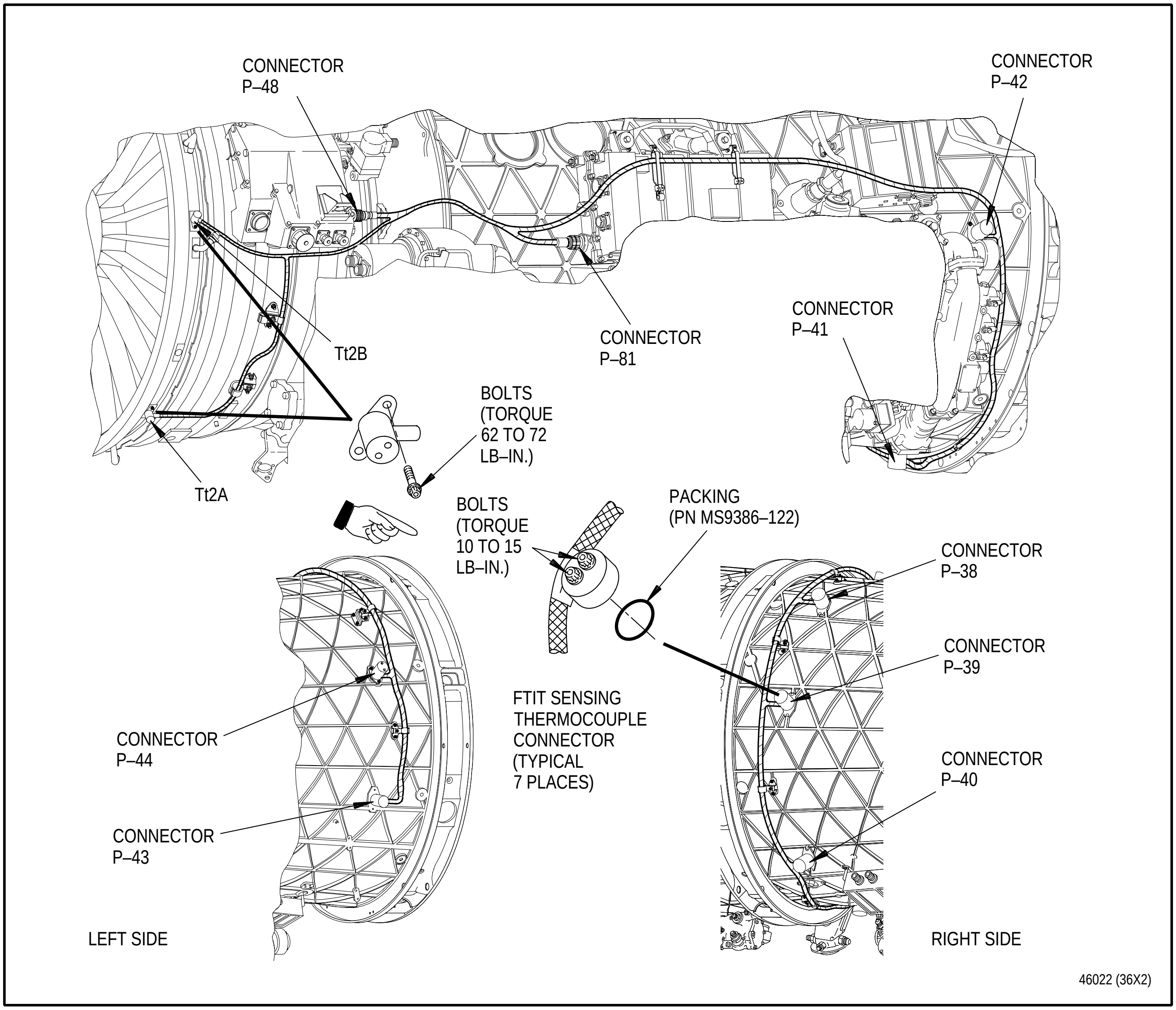


Figure 21. Thermocouple Special Purpose Electrical Branched Cable - Installation

i. Apply a light coat of PWA 550 antigalling compound to threads of bolts for T_{t2} A and T_{t2} B sensors.

j. Install T_{t2} A and T_{t2} B sensors. Torque bolts 62 to 72 pound-inches.

k. Torque bolts of hinged clamps holding cable in place on DEEC 27 to 30 pound-inches.

l. Engage upper half of hinged cushioned loop clamps holding cable in place and torque bolts 27 to 30 pound-inches.

m. Install ST2625-03 electrical cable ties.

16. ENGINE ACCESSORIES SPECIAL PURPOSE ELECTRICAL BRANCHED CABLE (GREEN) - INSTALLATION.

(See Figure 22.)

NOTE

If necessary, refer to T.O. 2J-F100-53-5, WP 064 00, for detailed cable clamping of all engine configurations.

a. Avoid sharp bends, twists, or kinks that may cause breakage of cable braid and wires.

b. Install engine accessories special purpose electrical branched cable on engine using clamps and hardware that is loosely installed on connecting brackets or engine case. Put a light coat of PWA 550 antigalling compound on threads of bolts. Tighten bolts fingertight. (See figure 22.)

c. Remove protective closures from receptacles P-51 on engine diagnostic unit, P-8 on oil pressure transmitter, P-149 on anti-icing valve and P-7 on engine exhaust nozzle position transmitter.

d. Connect following cable connectors to receptacles by aligning keyways and handtightening connector. Ensure red line on receptacle is not visible when viewed at right angles. Tighten connector firmly with soft-jawed pliers.

(1) Connector P-51 to receptacle J-51 on engine diagnostic unit.

(2) Connector P-8 to receptacle J-8 on oil pressure transmitter.

(3) Connector P-149 to receptacle J-149 on anti-icing valve.

(4) Connector P-7 to receptacle J-7 on engine exhaust nozzle position transmitter.

e. Torque bolts of hinged clamps holding cable in place on DEEC and gearbox bracket 27 to 30 pound-inches.

f. Torque bolts of loop clamps holding cable in place 27 to 30 pound-inches.

g. Engage upper half of hinged cushioned loop clamps holding cable in place and torque screws 27 to 30 pound-inches.

NOTE

Tie-wraps are not to be used to constrain cables/harnesses to tubes, hard mounts, or electrical connectors.

h. Install ST2625-03 electrical cable ties.

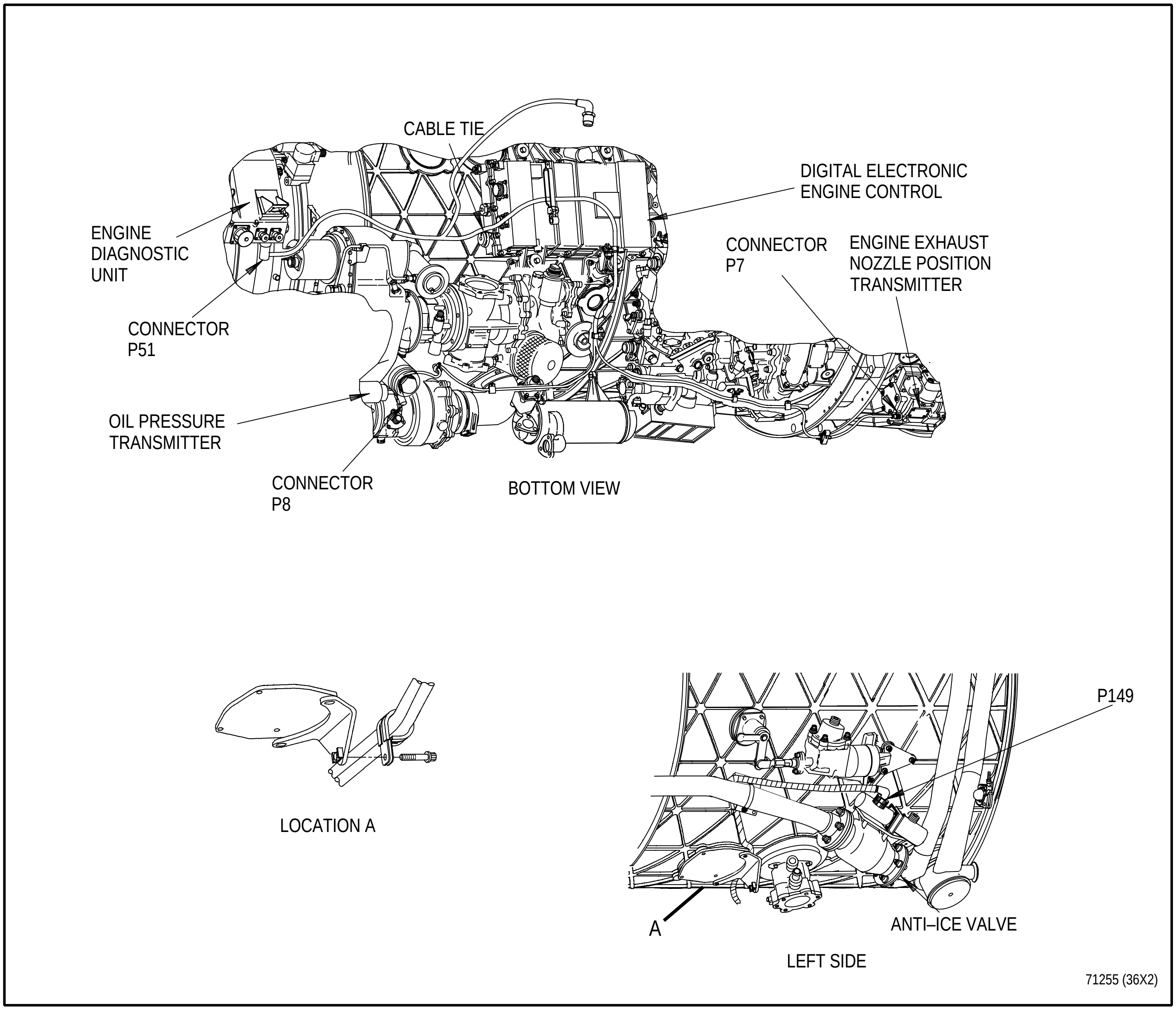


Figure 22. Engine Accessories Special Purpose Electrical Branched Cable - Installation

17. IGNITION SPECIAL PURPOSE ELECTRICAL BRANCHED CABLE (WHITE) - INSTALLATION. (See Figure 23.)

NOTE

If necessary, refer to T.O. 2J-F100-53-5, WP 064 00 for detailed cable clamping of all engine configurations.

a. Avoid sharp bends, twists, or kinks that may cause breakage of cable braid and wires.

b. Install ignition branched electrical special purpose cable on engine using clamps and hardware that is loosely installed on connecting brackets or engine case. Put a light coat of PWA 550 antigalling compound on threads of bolts. Tighten nuts fingertight. (See figure 23.)

c. Remove protective closures from receptacles J-119 on generator, J-26(L) and J-26(R) on both dual ignition exciters, J-113 on main fuel control and J-104 on augmentor fuel control.

d. Connect following cable connectors to receptacles by aligning keyways and handtightening connector. Ensure red line on receptacle is not visible when viewed at right angles. Tighten connector firmly with soft-jawed pliers.

(1) Connector P-119 to receptacle J-119 on generator. Install cable connector clamp (after TCTO 2J-F100229-562). Secure with bolt. Torque bolt 54 to 60 pound-inches.

(2) Connector P-26L and P-26R to receptacles J-26L and J-26R on dual ignition exciters.

(3) Connector P-113 to receptacle J-113 on main fuel control.

(4) Connector P-104 to receptacles J-104 on augmentor fuel control.

e. Torque bolts of hinged clamps holding cable in place on DEEC and gearbox bracket 27 to 30 pound-inches.

f. Engage upper half of hinged cushioned loop clamps holding cable in place and torque bolts 27 to 30 pound-inches.

NOTE

Tie-wraps are not to be used to constrain cables/harnesses to tubes, hard mounts, or electrical connectors.

g. Install ST2625-03 electrical cable ties.

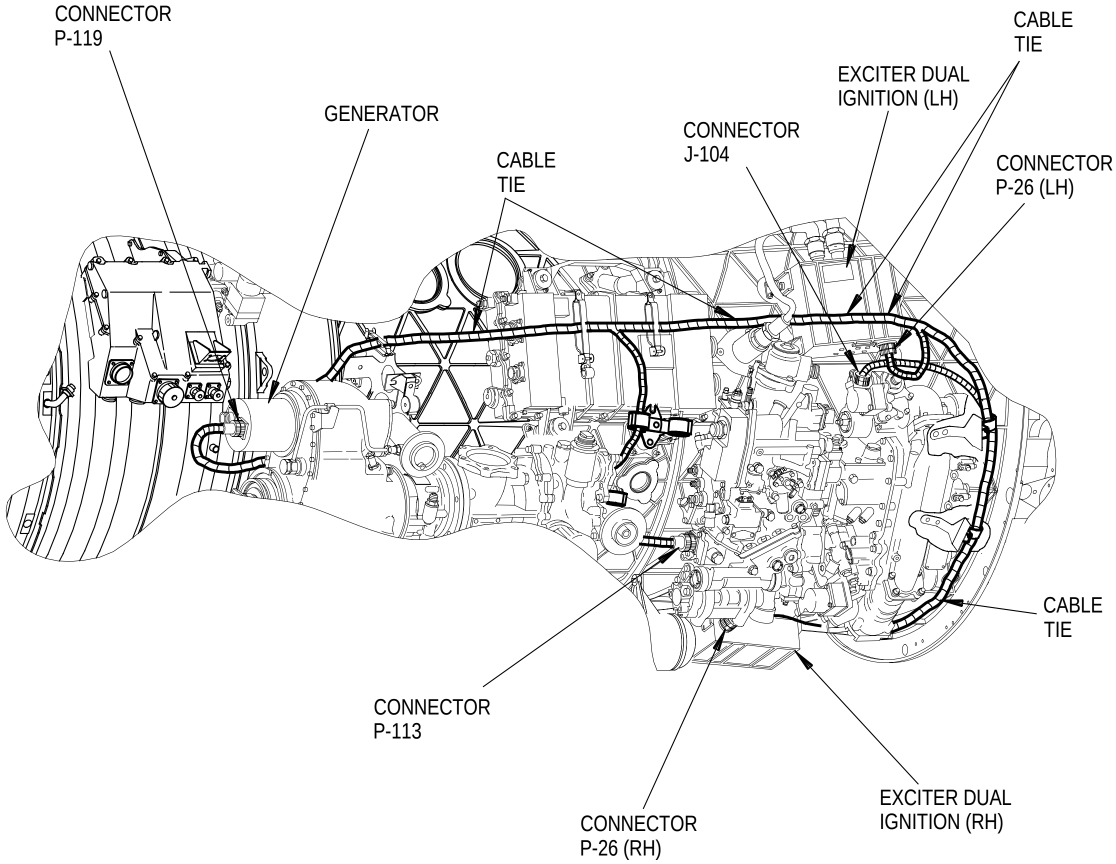


Figure 23. Ignition Special Purpose Electrical Branched Cable - Installation

18. GAS GENERATOR CONTROL SPECIAL PURPOSE ELECTRICAL BRANCHED CABLE (BROWN) - INSTALLATION.

(See Figure 24.)

NOTE

If necessary, refer to T.O. 2J-F100-53-5, WP 064 00 for detailed cable clamping of all engine configurations.

a. Avoid sharp bends, twists, or kinks that may cause breakage of cable braid and wires.

b. Install gas generator control special purpose electrical branched cable on engine using clamps and hardware that is loosely installed on connecting brackets. Tighten screws fingertight. (See figure 24.)

c. Remove protective closures from receptacle J-83 on DEEC, and receptacles J-107, J-108, J-109, J-110, and J-111 on main fuel control.

d. Connect following cable connectors to receptacles by aligning keyways and handtightening connector. Ensure red line on receptacle is not visible when viewed at right angles. Tighten connector firmly with soft-jawed pliers.

(1) Connector P-83 to receptacle J-83 on DEEC.

(2) Connectors P-107, P-108, P-109, P-110, and P-111 to receptacles J-107, J-108, J-109, J-110, and J-111 on main fuel control.

e. Engage upper half of hinged cushioned loop clamps holding cable in place and torque screws 27 to 30 pound-inches.

NOTE

Tie-wraps are not to be used to constrain cables/harnesses to tubes, hard mounts, or electrical connectors.

f. Install ST2625-03 electrical cable ties.

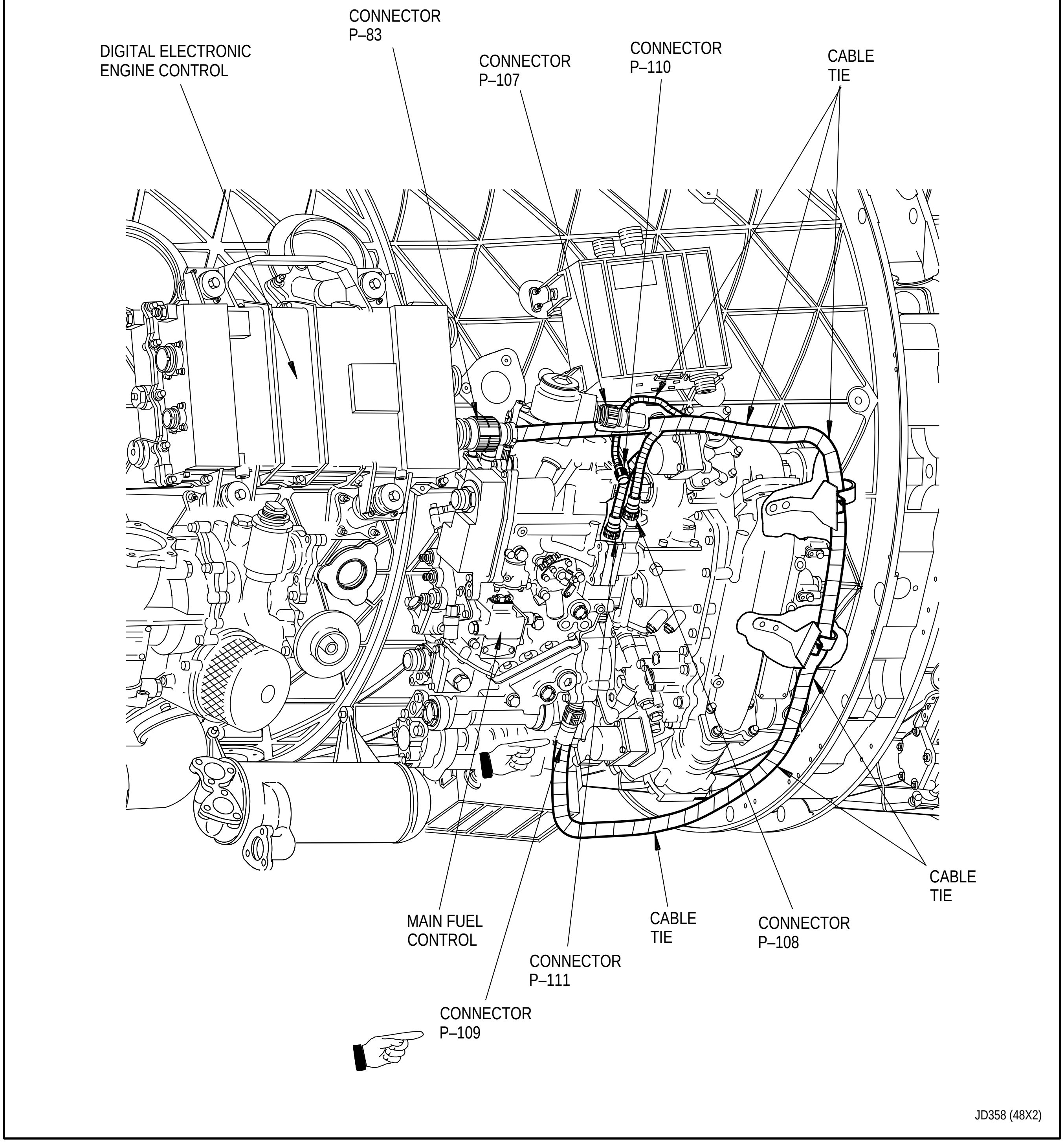


Figure 24. Gas Generator Control Special Purpose Electrical Branched Cable - Installation

19. AUGMENTOR FUEL MANAGEMENT SPECIAL PURPOSE ELECTRICAL BRANCHED CABLE (GRAY) - INSTALLATION.
(See Figure 25.)

NOTE

If necessary, refer to T.O. 2J-F100-53-5, WP 064 00 for detailed cable clamping of all engine configurations.

a. Avoid sharp bends, twists, or kinks that may cause breakage of cable braid and wires.

b. Install augmentor fuel management special purpose electrical branched cable on engine using clamps and hardware that is loosely installed on connecting brackets. Tighten screws fingertight. (See figure 25.)

c. Remove protective closures from receptacle J-84 on DEEC, and receptacles J-97, J-98, J-99, J-100, J-101, J-102, and J-103 on augmentor fuel control.

d. Connect following cable connectors to receptacles by aligning keyways and handtightening connector. Ensure red line on receptacle is not visible when viewed at right angles. Tighten connector firmly with soft-jawed pliers.

(1) Connector P-84 to receptacle J-84 on DEEC.

(2) Connectors P-97, P-98, P-99, P-100, P-101, P-102, and P-103 to receptacles J-97, J-99, J-100, J-101, J-102, and J-103 on augmentor fuel control.

e. Engage upper half of hinged cushioned loop clamps holding cable in place and torque screws 27 to 30 pound-inches.

NOTE

Tie-wraps are not to be used to constrain cables/harnesses to tubes, hard mounts, or electrical connectors.

f. Install ST2625-03 electrical cable ties.

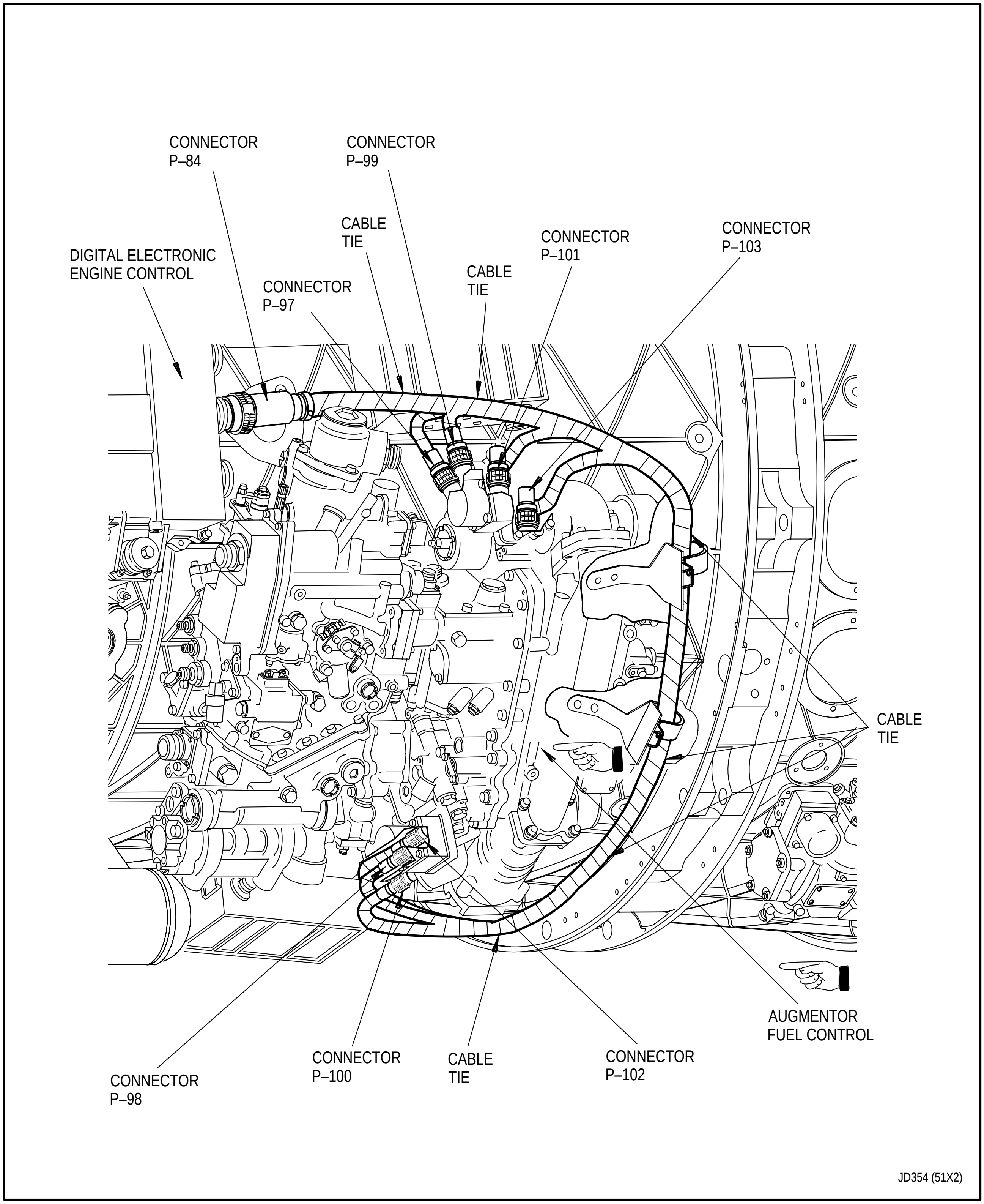


Figure 25. Augmentor Fuel Management Special Purpose Electrical Branched Cable - Installation

20. ENGINE ACTUATOR SPECIAL PURPOSE ELECTRICAL BRANCHED CABLE (YELLOW) - INSTALLATION.
(See Figure 26.)

NOTE

If necessary, refer to T.O. 2J-F100-53-5, WP 064 00 for detailed cable clamping of all engine configurations.

a. Avoid sharp bends, twists, or kinks that may cause breakage of cable braid and wires.

b. Install engine actuator special purpose electrical branched cable on engine using clamps and hardware that is loosely installed on connecting brackets or engine case. Put a light coat of PWA 550 antigalling compound on threads of bolts. Tighten bolts or nuts fingertight. (See figure 26.)

c. Remove protective closures from receptacle J-85 on DEEC, receptacles J-89 and J-90 from left and right side RCVV actuating cylinders respectively, receptacles J-93 and J-94 on CIVV control and cylinder, receptacle J-150 on anti-icing valve, and receptacles J-91, and J-92 on convergent exhaust nozzle control.

d. Connect following cable connectors to receptacles by aligning keyways and handtightening connector. Ensure red line on receptacle is not visible when viewed at right angles. Tighten connector firmly with soft-jawed pliers.

(1) Connector P-85 to receptacle J-85 on DEEC.

(2) Connectors P-89 and P-90 to receptacles J-89 and J-90 on left and right side RCVV actuating cylinder respectively.

(3) Connectors P-93 and P-94 to receptacles J-93 and J-94 on CIVV control and cylinder.

(4) Connector P-150 to receptacle J-150 on anti-icing valve.

(5) Connectors P-91 and P-92 to receptacles J-91 and J-92 on convergent exhaust nozzle control.

e. Torque bolts of hinged clamps holding cable in place on DEEC and gearbox bracket 27 to 30 pound-inches.

f. Torque bolt of loop clamp holding cable in place 27 to 30 pound-inches.

g. Engage upper half of block clamp holding cable in place and torque nuts 23 to 26 pound-inches.

h. Engage upper half of hinged cushioned loop clamps holding cable in place and torque screws 27 to 30 pound-inches.

NOTE

Tie-wraps are not to be used to constrain cables/harnesses to tubes, hard mounts, or electrical connectors.

i. Install ST2625-03 electrical cable ties.

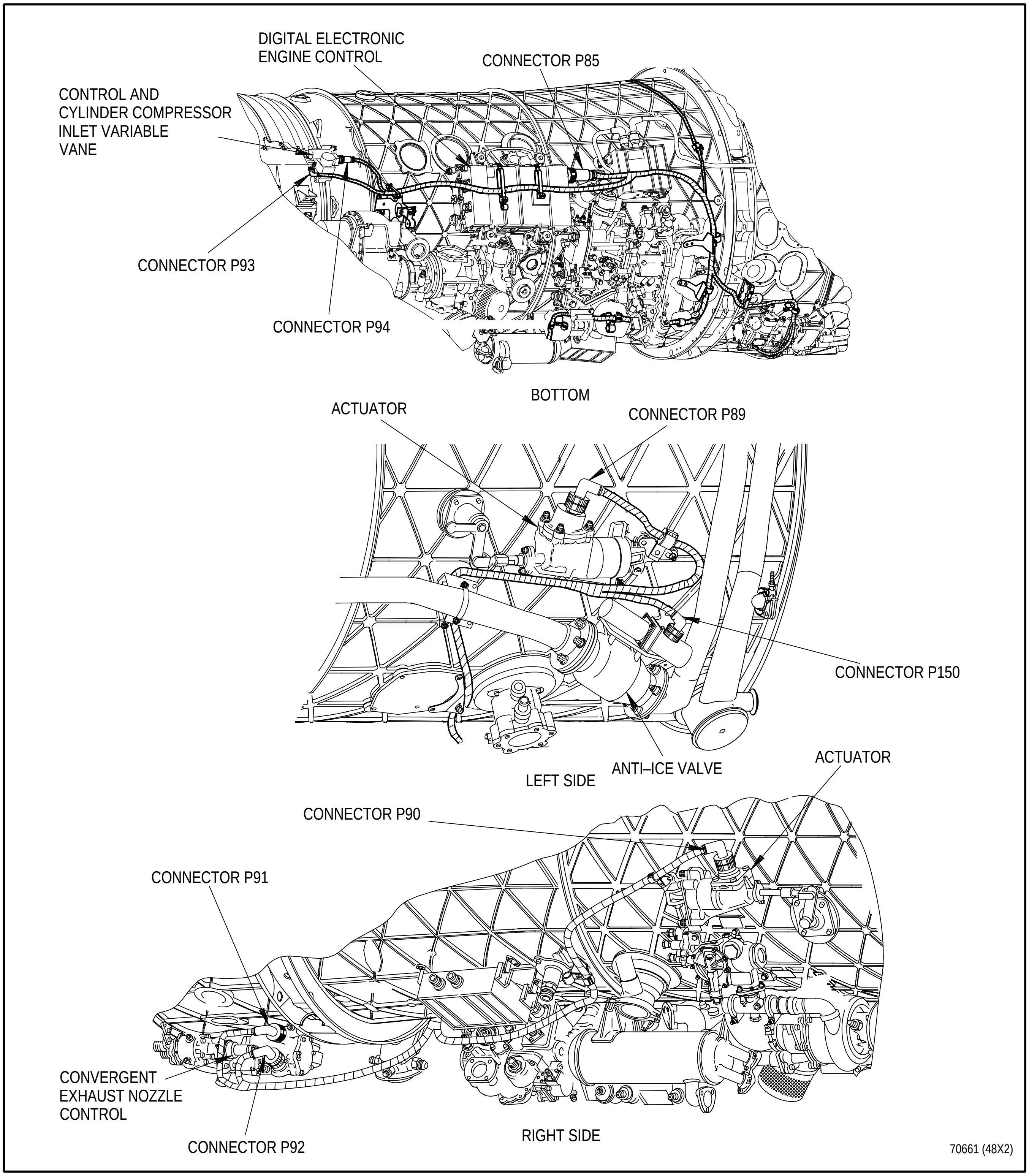


Figure 26. Engine Actuator Special Purpose Electrical Branched Cable - Installation

21. EDU GROUND INTERFACE SPECIAL PURPOSE ELECTRICAL BRANCHED CABLE (VIOLET) - INSTALLATION.

(See Figure 27.)

NOTE

If necessary, refer to T.O. 2J-F100-53-5, WP 064 00 for detailed cable clamping of all engine configurations.

a. Avoid sharp bends, twists, or kinks that may cause breakage of cable braid and wires.

b. Install EDU ground interface special purpose electrical branched cable on engine using clamps and hardware that is loosely installed on connecting brackets or engine case. Tighten screws fingertight. (See figure 27.)

c. Remove protective closure from receptacle J-70 on engine diagnostic unit.

d. Connect cable connector P-70 to receptacle J-70 by aligning keyways and handtightening connector. Ensure red line on receptacle is not visible when viewed at right angles. Tighten connector firmly with soft-jawed pliers.

e. Secure receptacle J-146 to bracket on oil pump as follows:

(1) Apply a light coat of PWA 36545 antigalling compound to four screws, remove excess.

(2) Insert receptacle into hole in bracket and secure with four screws and nuts. Torque nuts 27 to 30 pound-inches.

(3) Install protective closure on connector.

f. Secure thermocouple to anti-icing manifold as follows:

(1) Apply a light coat of MIL-L-7808 engine oil to threads of two bolts, remove excess.

(2) Position thermocouple on anti-icing manifold and secure with two bolts. Torque bolts 36 to 40 pound-inches.

g. Engage upper half of hinged cushioned loop clamps holding cable in place and torque screws 27 to 30 pound-inches.

NOTE

Tie-wraps are not to be used to constrain cables/harnesses to tubes, hard mounts, or electrical connectors.

h. Install ST2625-03 electrical cable ties.

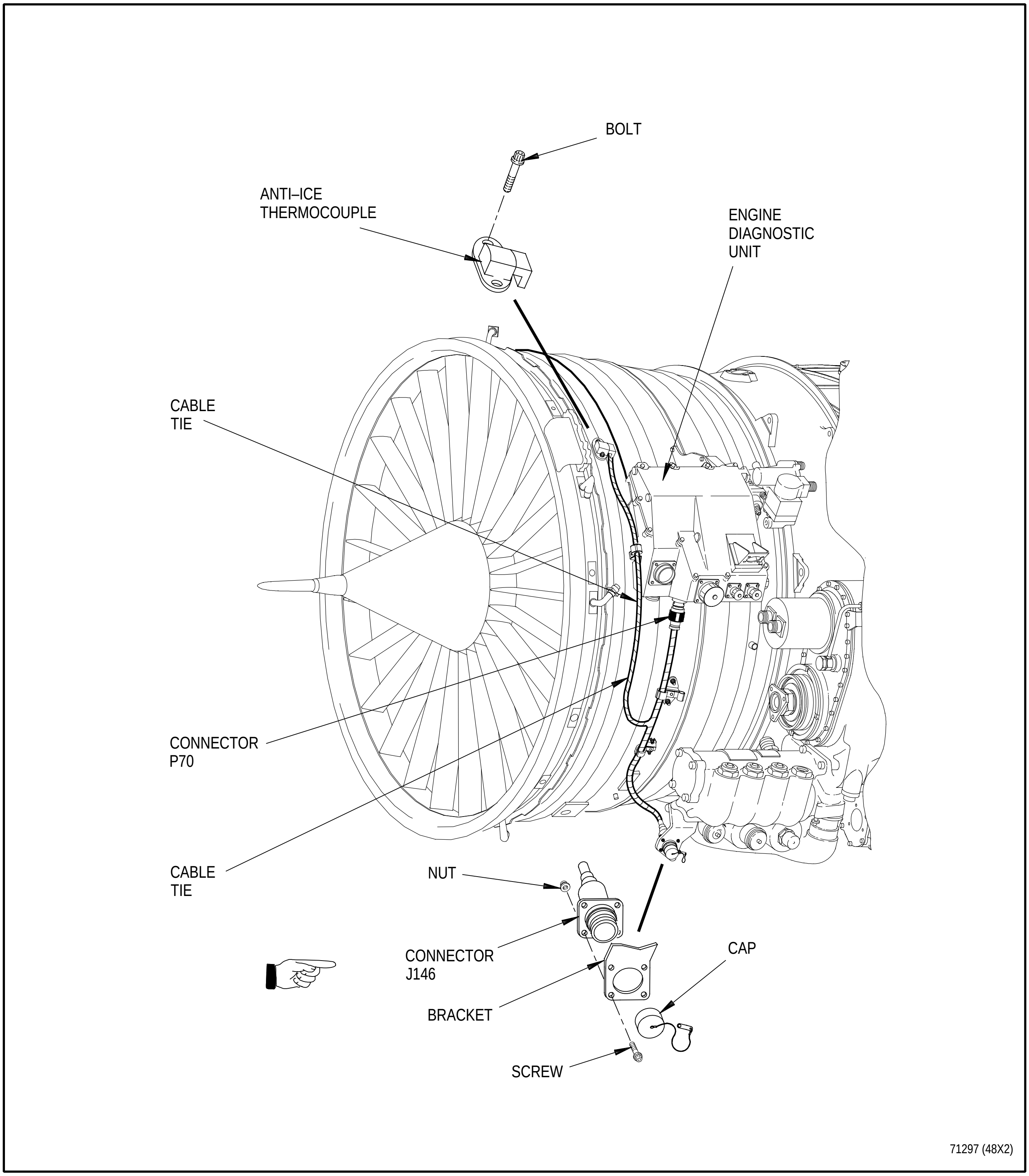


Figure 27.   EDU Ground Interface Special Purpose Electrical Branched Cable - Installation

22. POWER AND SPEED SPECIAL PURPOSE ELECTRICAL BRANCHED CABLE (BLUE) - INSTALLATION.

(See Figure 28.)

NOTE

If necessary, refer to T.O. 2J-F100-53-5, WP 064 00 for detailed cable clamping of all engine configurations.

a. Avoid sharp bends, twists, or kinks that may cause breakage of cable braid and wires.

b. Install power and speed special purpose electrical branched cable on engine using clamps and hardware that is loosely installed on connecting brackets or engine case. Put a light coat of PWA 550 antigalling compound on threads of bolts. Tighten bolts fingertight. (See figure 28.)

c. Remove protective closures from receptacles J-50 and J-121 on engine diagnostic unit, receptacle J-118 on generator, receptacles J-53, J-142 and J-143 on fan inlet case, receptacle J-82 on DEEC, receptacle J-112 on main fuel control and receptacle J-116 on augmentor light off detector.

d. Connect following cable connectors to receptacles by aligning keyways and handtightening connector. Ensure red line on receptacle is not visible when viewed at right angles. Tighten connector firmly with soft-jawed pliers.

(1) Connectors P-53, P-142 and P-143 to receptacles J-53, J-142 and J-143 on fan inlet case.

(2) Connectors P-50 and P-121 to receptacles J-50 and J-121 on engine diagnostic unit.

(3) Connector P-118 to receptacle J-118 on generator. Install cable connector clamp (after TCTO 2J-F100229-562). Secure with bolt. Torque bolt 54 to 60 pound-inches.

(4) Connector P-82 to receptacle J-82 on DEEC.

(5) Connector P-112 to receptacle J-112 on main fuel control.

(6) Connector P-116 to receptacle J-116 on augmentor light off detector.

NOTE

Tie-wraps are not to be used to constrain cables/harnesses to tubes, hard mounts, or electrical connectors.

e. Install ST2625-03 electrical cable ties.

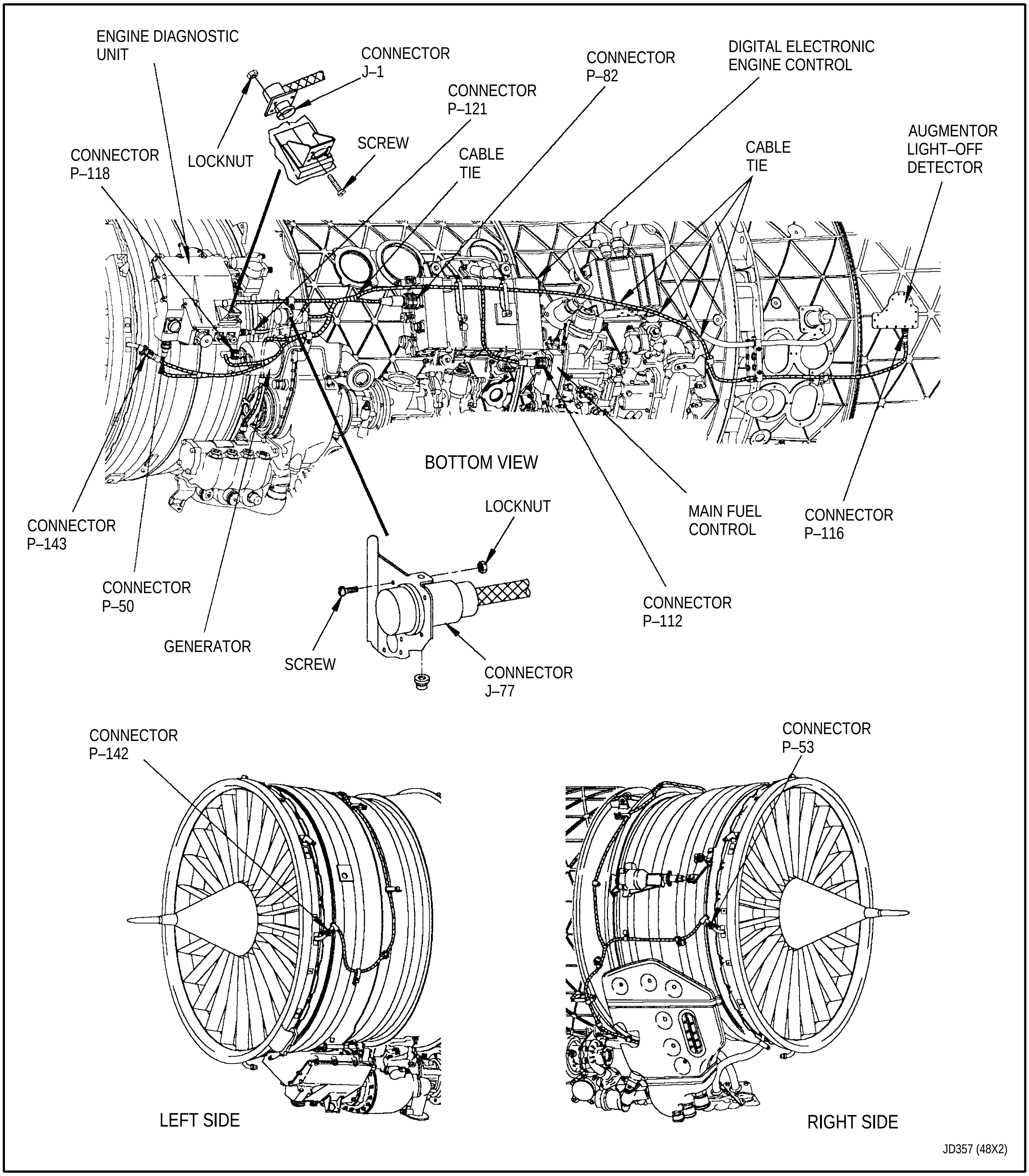


Figure 28. Power and Speed Special Purpose Electrical Branched Cable - Installation

e. Secure receptacle J-1 to bracket on engine diagnostic unit as follows:

(1) Apply a light coat of PWA 36545 antigalling compound to threads of four screws. Remove excess.

(2) Insert receptacle into hole in bracket and secure with four screws and nuts. Torque nuts 5 to 6 pound-inches.

f. Secure receptacle J-77 to bracket on main gear box as follows:

(1) Apply a light coat of PWA 36545 antigalling compound to threads of four screws.

(2) Insert receptacle into hole in bracket and secure with four screws and nuts. Torque nuts 5 to 6 pound-inches.

(3) Install protective closure on connector.

g. Torque bolts of hinged clamps holding cable in place on DEEC 27 to 30 pound-inches.

h. Torque bolts of loop clamps holding cable in place 27 to 30 pound-inches.

i. Engage upper half of block clamps holding cable in place and torque nuts 23 to 26 pound-inches.

j. Engage upper half of hinged cushioned loop clamps holding cable in place and torque screws 27 to 30 pound-inches.

NOTE

Tie-wraps are not to be used to constrain cables/harnesses to tubes, hard mounts, or electrical connectors.

k. Install ST2625-03 electrical cable ties.

23. DATA BUS ELECTRICAL BRANCHED DEEC OPTION A, 1553 CABLE (BLACK) - INSTALLATION.

(See Figure 29.)

NOTE

If necessary, refer to T.O. 2J-F100-53-5, WP 064 00 for detailed cable clamping of all engine configurations.

a. Avoid sharp bends, twists, or kinks that may cause breakage of cable braid and wires.

b. Remove protective closures from receptacles J-87 and J-88 on DEEC.

c. Connect cable connectors P-87 and P-88 to receptacles J-87 and J-88 of DEEC by aligning keyways and handtightening connector. Ensure red line on receptacle is not visible when viewed at right angles. Tighten connector firmly with soft-jawed pliers. (See figure 29.)

d. Secure receptacle J-171 to bracket on main gearbox as follows:

(1) Apply a light coat of PWA 36545 antigalling compound to threads of four screws.

(2) Insert receptacle into hole in bracket and secure with four screws and nuts. Torque nuts 5 to 6 pound-inches.

NOTE

Tie-wraps are not to be used to constrain cables/harnesses to tubes, hard mounts, or electrical connectors.

e. Install ST2625-03 electrical cable ties.

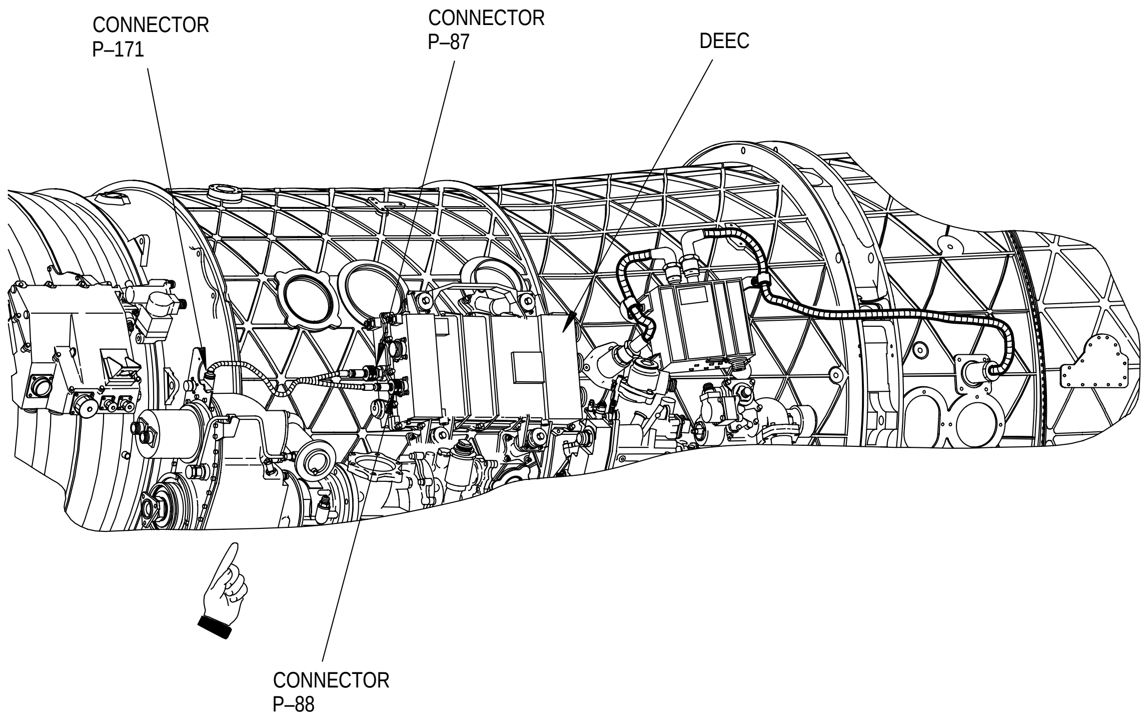


Figure 29. Data Bus Electrical Branched DEEC Option A, 1553 Cable - Installation

WORK PACKAGE

TECHNICAL PROCEDURES

CABLES - POWER, EXCITER TO IGNITER

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 22

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 4	22	12 - 14	0	16 - 17	0
5 - 10	0	15	22	18 - 21	7
11	21			22 Blank	7

REFERENCE MATERIAL REQUIRED

None

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Alcohol, isopropyl	TT-I-735 Grade A, or PMC 9016
Brush, solder	-
Cable, 7mm 4 ft	A6365-L-G16 or 23191
Clean cloth, lint-free	-
Compound, antigalling (PWA 550)	Hi-T-550 or Lubri-Bond HT
Compound, silicone dielectric	MIL-S-8660C
Contact, high tension	12617
Flux	AMS 3410
Lockwire (0.032 inch diameter)	MS9226-04
Powder, talcum	-
Solder, silver	AMS 4770
Solvent, dielectric	PMC 8910
Tape, glass	MIL-I-19166 or No. 69 Fiberglass

EXPENDABLE ITEMS

None

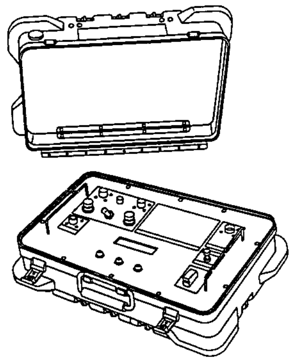
APPLICABLE SUPPORT EQUIPMENT

NOTE

PWA 52176 and PWA 52234 leads are details of PWA 50025 ignition test set. PN 137375 ignition test set may also be used.

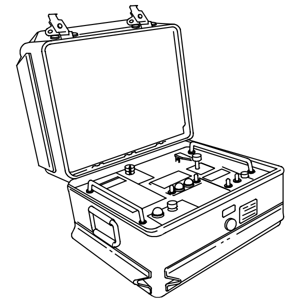
Paragraph	Function - Tool Nomenclature	Tool Number
1	Introduction	
	Ignition test set	PN 137375
2	Exciter to Igniter Electrical Power Cables - Removal	
	Exciter-To-Igniter Removal Shorting Lead	PWA 52176
6	Exciter to igniter electrical power cables - Repair	
	Ignition test set	PWA 50025 or PN 137375
	Lead, high tension, modified	PWA 52234

ILLUSTRATED SUPPORT EQUIPMENT



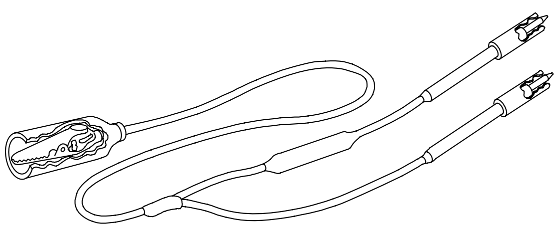
PN 137375 –C

Figure T1. PN 137375 Ignition Test Set



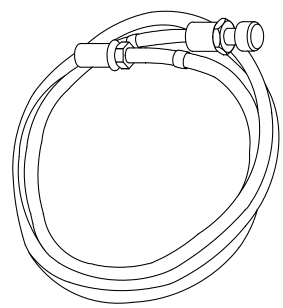
PWA 50025 –C

Figure T2. PWA 50025 Test Set



PWA 52176 –C

Figure T3. PWA 52176 Shorting Lead



PWA 52234 –C

Figure T4. PWA 52234 Test Lead

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures on the exciter to igniter electrical power cables:

- Removal
- Disassembly
- Cleaning
- Inspection
- Repair
- Assembly
- Installation

NOTE

If PN 137375 ignition test set is used procedures are performed using operation and maintenance manual accompanying ignition test set.

2. EXCITER TO IGNITER ELECTRICAL POWER CABLES - REMOVAL.
(See Figures 1 and 2.)

WARNING

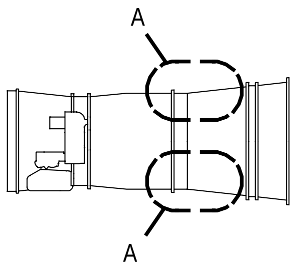
Ignition system output voltage is dangerously high and shall be completely discharged immediately after carefully removing exciter to main igniter power cable. For complete discharge, system shall be inactive for at least 2 minutes and then grounded through PWA 52176 lead.

a. Discharge dual ignition exciters as required. (See figure 1.)

CAUTION

Use care when handling electrical cable to avoid sharp bends, twists, or kinks that may cause breakage of cable braid or wires.

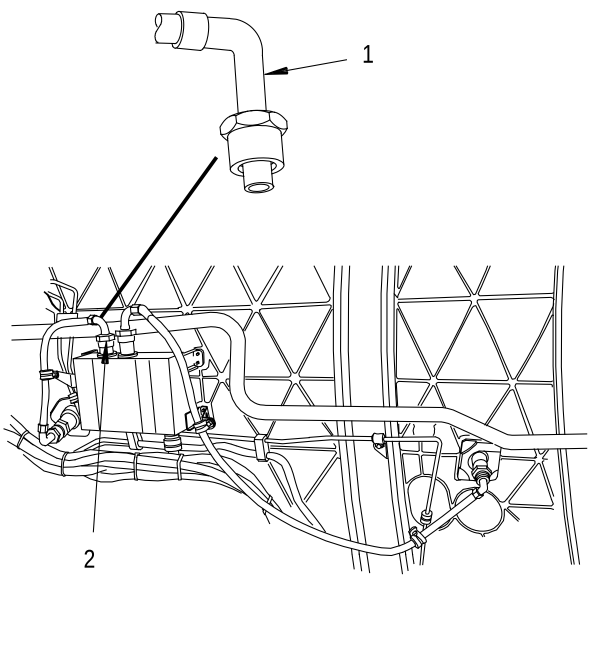
b. Remove all nuts and bolts from clamps and open remaining quick release clamps holding cable in place. Loosely install hardware (nuts, bolts, spacers, as applicable) on connecting bracket or clamp.



WARNING

ENSURE THAT NO EXPLOSIVES, FLAMMABLE GAS OR LIQUIDS ARE IN AREA DURING THIS PROCEDURE.

a. DISCONNECT EXCITER TO IGNITER ELECTRICAL POWER CABLE (1) FROM DUAL IGNITION EXCITER RECEPTACLE J27 (2).



VIEW A
(TYPICAL–BOTH SIDES)

b. CONNECT ALLIGATOR GROUND CLIP (4) OF PWA 52176 SHORTING LEAD TO ENGINE GROUND (AN UNPAINTED BOLT HEAD) OR EXCITER BRACKET.

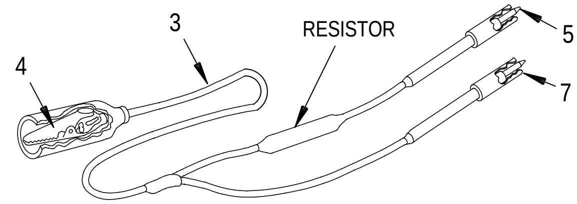
WARNING

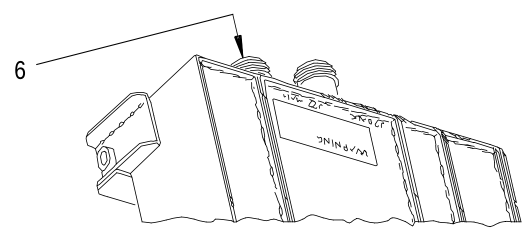
TO AVOID SPARK, LEAD (5, LEAD WITH RESISTOR) SHALL BE HELD FIRMLY TO TERMINAL IN EXCITER RECEPTACLE J27 (6).

NOTE

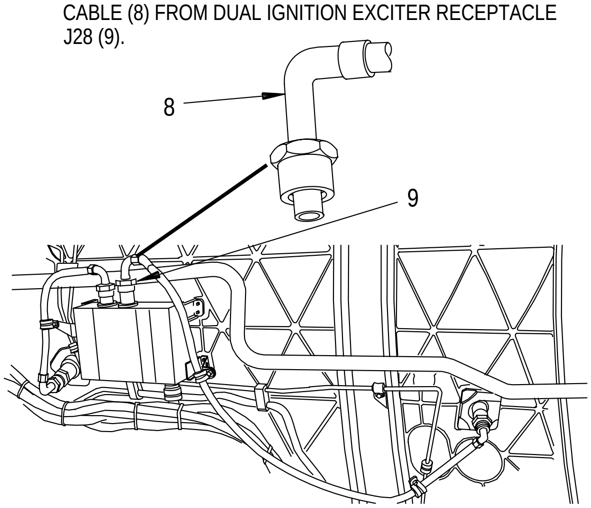
c. TOUCH LEAD (5, LEAD WITH RESISTOR) FIRMLY TO TERMINAL IN EXCITER RECEPTACLE J27 (6) FOR APPROXIMATELY 1 MINUTE, THEN REMOVE.

d. TOUCH LEAD (7) FIRMLY TO TERMINAL IN EXCITER RECEPTACLE J27 (6) FOR APPROXIMATELY 1 MINUTE, THEN REMOVE.





e. DISCONNECT EXCITER TO IGNITER ELECTRICAL POWER CABLE (8) FROM DUAL IGNITION EXCITER RECEPTACLE J28 (9).

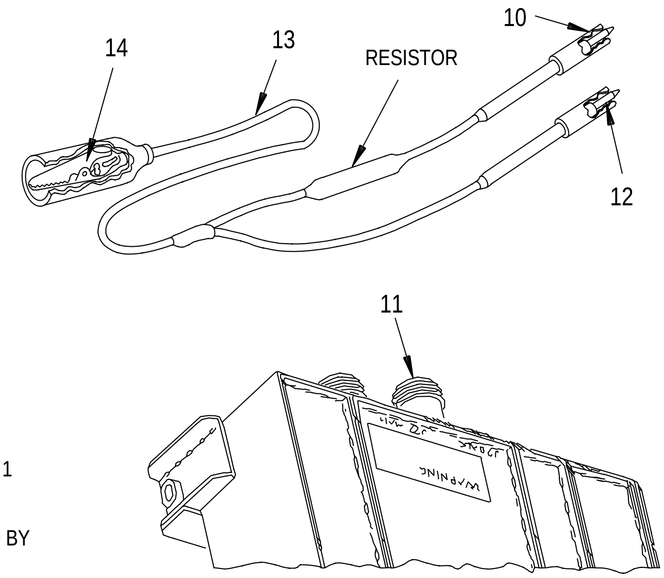


JD110X2 (51X2)

Figure 1. Dual Ignition Exciters - Electrical Discharge Procedure (Sheet 1 of 2)

WARNING

TO AVOID SPARK, RESISTOR PROBE LEAD (10) SHALL BE HELD FIRMLY ON TERMINAL IN EXCITER RECEPTACLE J28 (11).



f. TOUCH LEAD (10, LEAD WITH RESISTOR) FIRMLY TO TERMINAL IN EXCITER RECEPTACLE J28 (11) FOR APPROXIMATELY 1 MINUTE, THEN REMOVE.

g. TOUCH GROUND LEAD (12) FIRMLY TO TERMINAL IN EXCITER RECEPTACLE J28 (11) FOR APPROXIMATELY 1 MINUTE, THEN REMOVE.

h. REMOVE SHORTING LEAD (13) FROM ENGINE GROUND BY RELEASING CLIP (14).

JD111X4 (24X2)

Figure 1. Dual Ignition Exciters - Electrical Discharge Procedure (Sheet 2 of 2)

c. Disconnect connectors P29 and P34 and remove left and right exciter to main igniter electrical power cables. (See figure 2.) Install protective closures.

d. Disconnect connectors P30 and P35 and remove left and right exciter to augmentor igniter electrical power cables. (See figure 2.) Install protective closures.

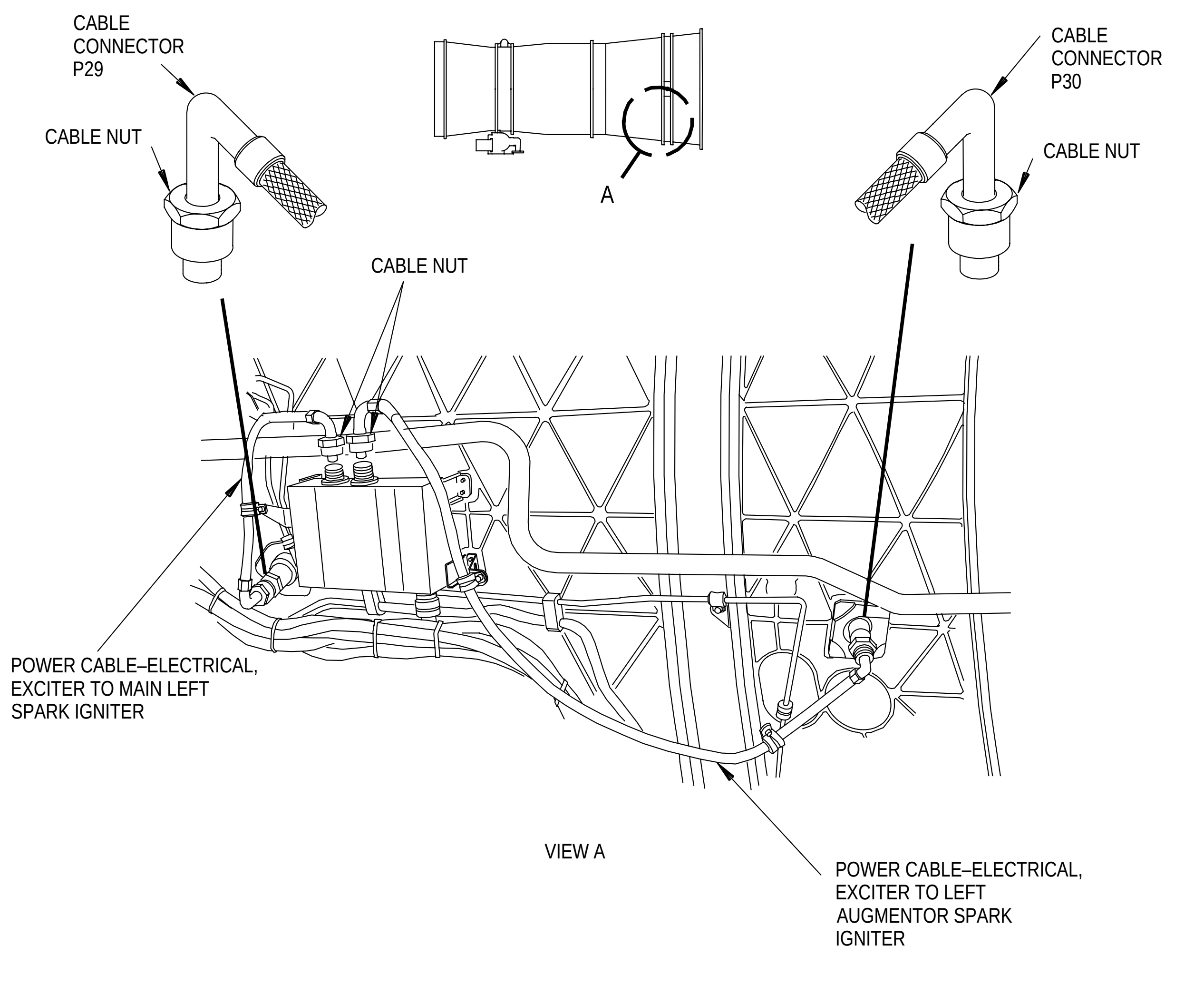


Figure 2. Exciter To Igniter Electrical Power Cable - Removal (Sheet 1 of 2)

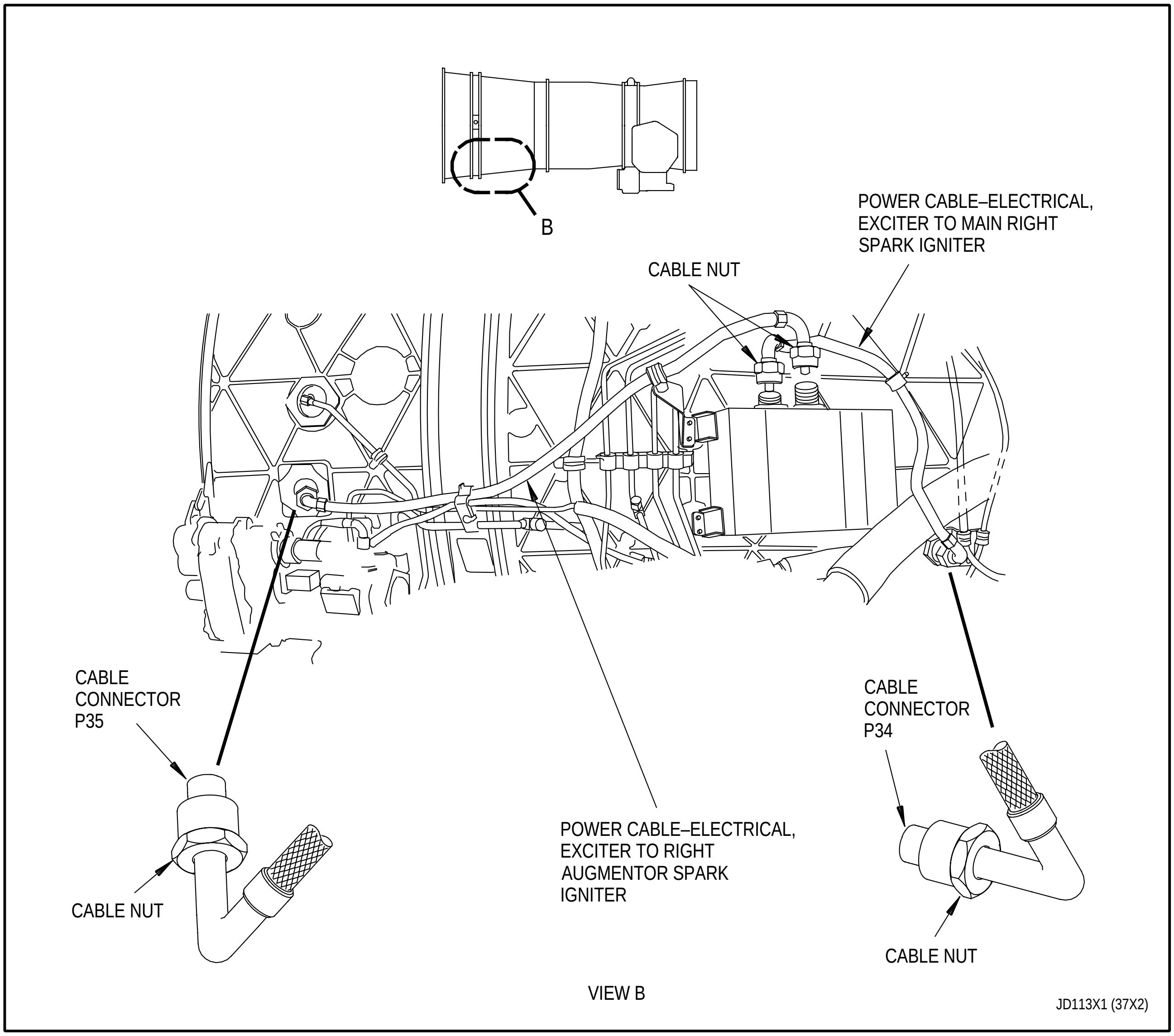


Figure 2. Exciter To Igniter Electrical Power Cable - Removal (Sheet 2 of 2)

3. EXCITER TO IGNITER ELECTRICAL POWER CABLES - DISASSEMBLY.
(See Figure 3.)

CAUTION

Do not allow cable to bend to a radius of less than 5 inches to prevent possible breakage of cable conduit.

NOTE

- Disassemble cable assembly only if necessary to replace faulty components.
- Keep detail parts of cable assembly together for later inspection and assembly to same cable.

a. Remove retaining ring from end of exciter to igniter power cable and discard.

b. Remove insulator, rubber grommet, and spring from power cable. If grommet is damaged during disassembly, discard grommet.

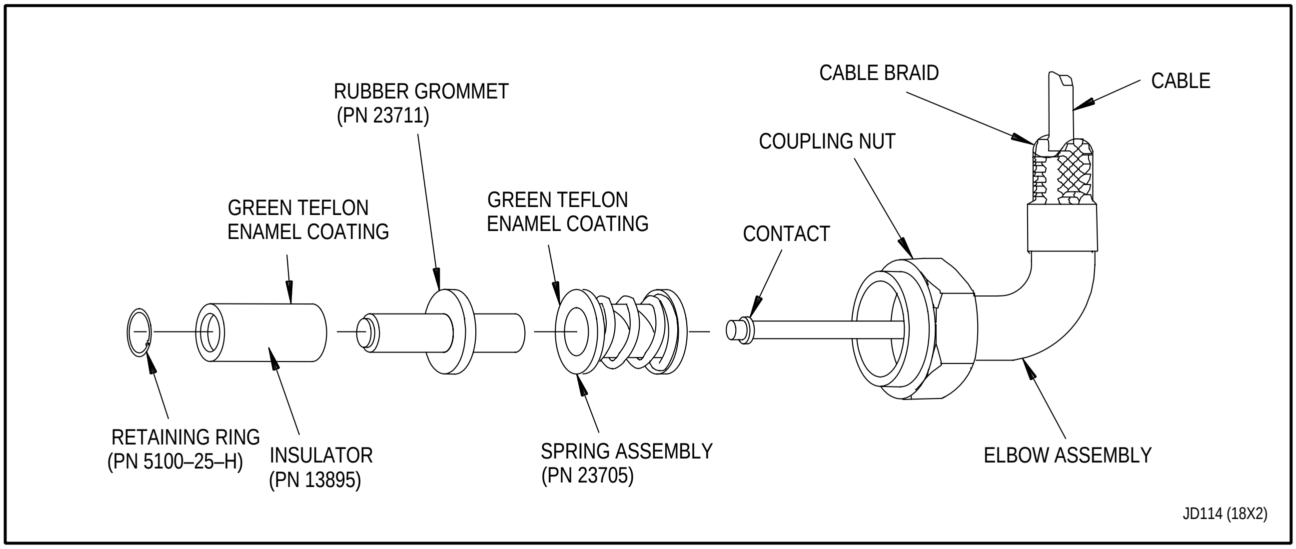


Figure 3. Exciter to Igniter Electrical Power Cables - Disassembly

4. EXCITER TO IGNITER ELECTRICAL POWER CABLES - CLEANING.
(See figure 3.)

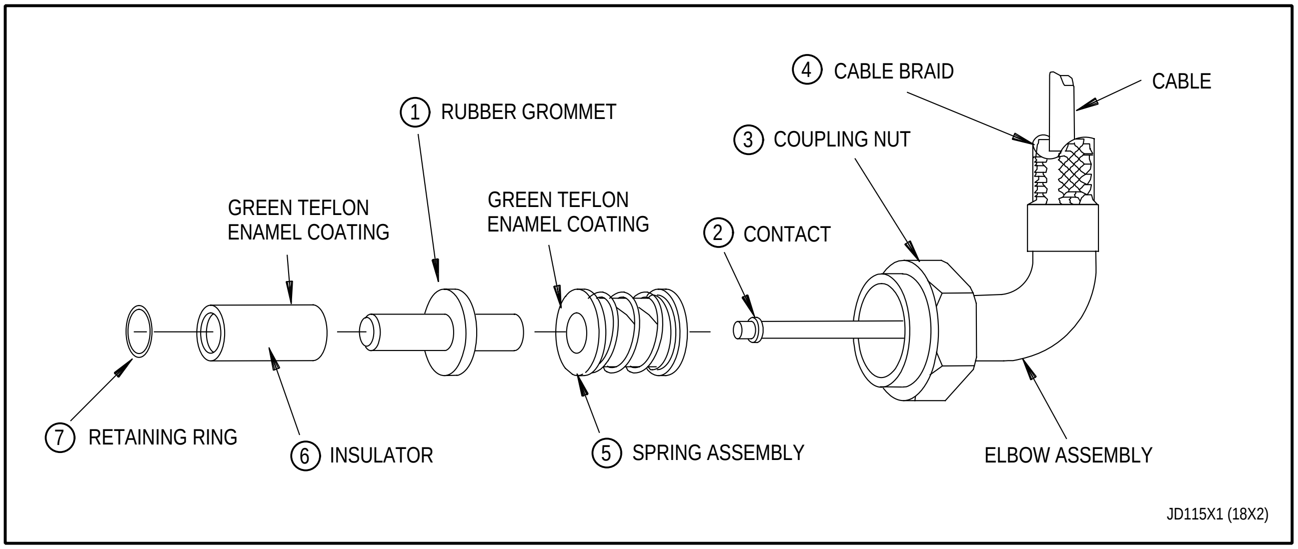
a. Clean and remove residue from ceramic insulator and contact (figure 3) with cloth moistened with isopropyl alcohol TT-I-735 Grade A, or PMC 9016, or dielectric solvent PMC 8910. Do not remove green Teflon enamel coating from end surface of insulator.

b. Dry with clean compressed air at less than 30 psig.

c. Remove dirt or other foreign matter from spring with compressed air. Do not remove green Teflon enamel coating from end surface.

5. EXCITER TO IGNITER ELECTRICAL POWER CABLE - INSPECTION.
(See Figure 4.)

a. Inspect detail parts of exciter to igniter electrical power cables. (See figure 4.)



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1.Rubber grommet -			
Torn, burned, or section missing	Not serviceable	Not reparable	Replace grommet.
2.Contact -			
Excessive wear or deformation	Not serviceable	Not reparable	Replace exciter to igniter electrical power cable.

Figure 4. Exciter To Igniter Electrical Power Cables - Inspection

Legend to figure 4 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
3.Coupling nut -			
Thread damage	Not servicable	Not reparable	Replace exciter to igniter electrical power cable.
4.Cable braid -			
Fraying, worn through	No more than 30 broken ends per 1/2 inch cable length. No more than three such areas per foot of cable length.	Not reparable	Replace exciter to igniter electrical power cable.
5.Spring assembly -			
Green Teflon coating worn through	Not serviceable	Not reparable	Replace spring.
6.Insulator -			
Carbon tracks	Not serviceable	See corrective action.	Clean per paragraph 4. If carbon tracks can not be removed by cleaning, replace insulator.
Cracked ceramic	Not serviceable	Not reparable	Replace insulator.
Green Teflon coating worn through	Not serviceable	Not reparable	Replace insulator.
7.Retaining ring -			
Bent	Not serviceable	Not reparable	Replace ring.

6. EXCITER TO IGNITER ELECTRICAL POWER CABLES - REPAIR.
(See Figure 5.)

a. Replace exciter to igniter electrical power cable contact and cable as follows:

(1) Disassemble power cable per paragraph 3.

(2) Hold contact(4, figure 5) and cut cable(5) 1/16 inch behind contact(4).

(3) Remove cable(5) from other end of conduit(1) and discard cable.

(4) Using a slight touch of talcum powder to reduce friction, install new cable(5) into conduit(1).

(5) Cut cable(5) so 2 inches of cable extends beyond mouth of elbows(2) at each end of conduit(1).

(6) Strip 1/4 inch of insulation from one end of cable(5).

(7) Place silver solder and flux in well of contact(4).

(8) Hold contact(4) on soldering iron until solder melts.

(9) Install end of cable(5) into well of contact(4) until cable bottoms in contact.

(10) Remove soldering iron and support cable(5) and contact(4) in position until solder hardens.

(11) Do not allow solder to flow either onto sides of contact(4) or back along cable(5) strands.

(12) Clean soldered joint with hot water and dry thoroughly.

CAUTION

Do not use any type of liquid or greasy lubricant during assembly of detail cable parts to guard against deterioration of bushings and insulators.

(13) Assemble exciter to igniter electrical power cable per paragraph 7.

(14) Remove any excess traces of talcum powder.

(15) Pull on opposite end of cable(5) until tight.

(16) Cut cable(5) 1 3/4 inches from end of elbow(2).

(17) Strip 1/4 inch of insulation from end of cable(5).

(18) Install contact(4) and assemble detail cable parts per steps a(7) through a(14).

b. Install protective cap on one end of electrical power cable. Hold cap while turning coupling nut(3) to prevent twisting of electrical power cable.

NOTE

If PN 137375 ignition test set is used procedures are performed using operation and maintenance manual accompanying ignition test set.

c. Test exciter to igniter electrical power cable as follows:

(1) Install end of PWA 52234 lead in receptacle J2 on PWA 50025 ignition test set.

(2) Connect open end of PWA 52234 lead to open end on electrical power cable.

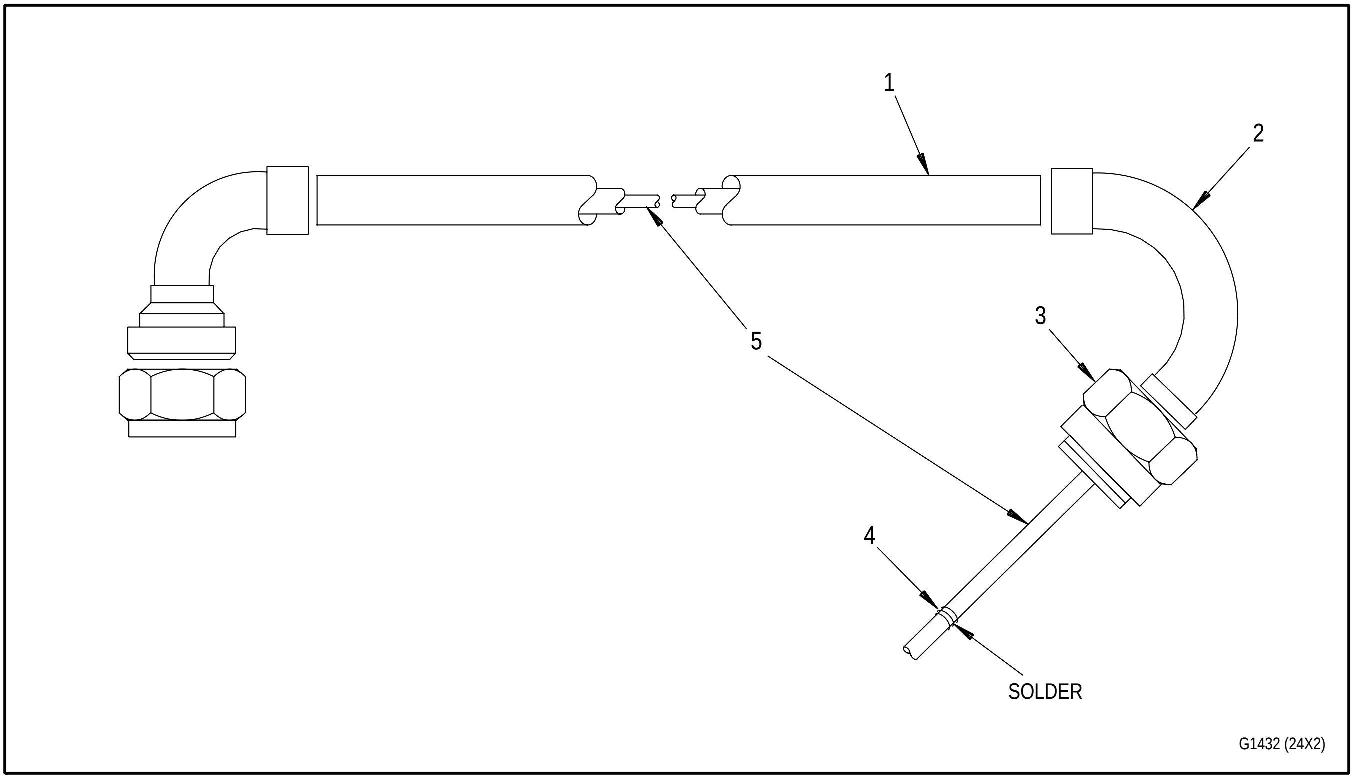
(3) Isolate electrical power cable from any metallic work bench or other source that can cause creepage.

(4) Turn power on to PWA 50025 ignition test set. Adjust knob R28 to 19000 RMS (27,000 volts AC peak) and maintain for a minimum of 1 minute.

(5) There shall be no indication of leakage or breakdown by puncture or creepage. Creepage can be recognized by the inability to reach full voltage or RMS needle declining toward zero.

(6) Turn off power and disconnect PWA 50025 ignition test set from electrical power cable.

(7) Install protective cap on electrical power cable. Hold cap while turning coupling nut(3) to prevent twisting of electrical power cable.



1. Conduit
2. Elbow
3. Coupling nut
4. Contact
5. Cable

Figure 5. Exciter to Igniter Electrical Power Cable - Repair

7. EXCITER TO IGNITER ELECTRICAL POWER CABLES - ASSEMBLY.
(See Figure 6.)

CAUTION

Do not use lubricants of any kind on detail parts of cable end. Deterioration of rubber grommet or cable insulation may result. Ceramic insulator shall be completely dry before assembling in power cable.

NOTE

A very small amount of talcum powder may be used on detail parts of cable for ease of assembly.

a. Ensuring insulator is completely dry, install PN 23705 spring (green Teflon end toward grommet), PN 23711 rubber grommet, and PN 12895 insulator (green Teflon end toward grommet) over contact on end of cable.

b. Using external ring expansion pliers, install new retaining ring, PN 5100-25-H, in slot of contact.

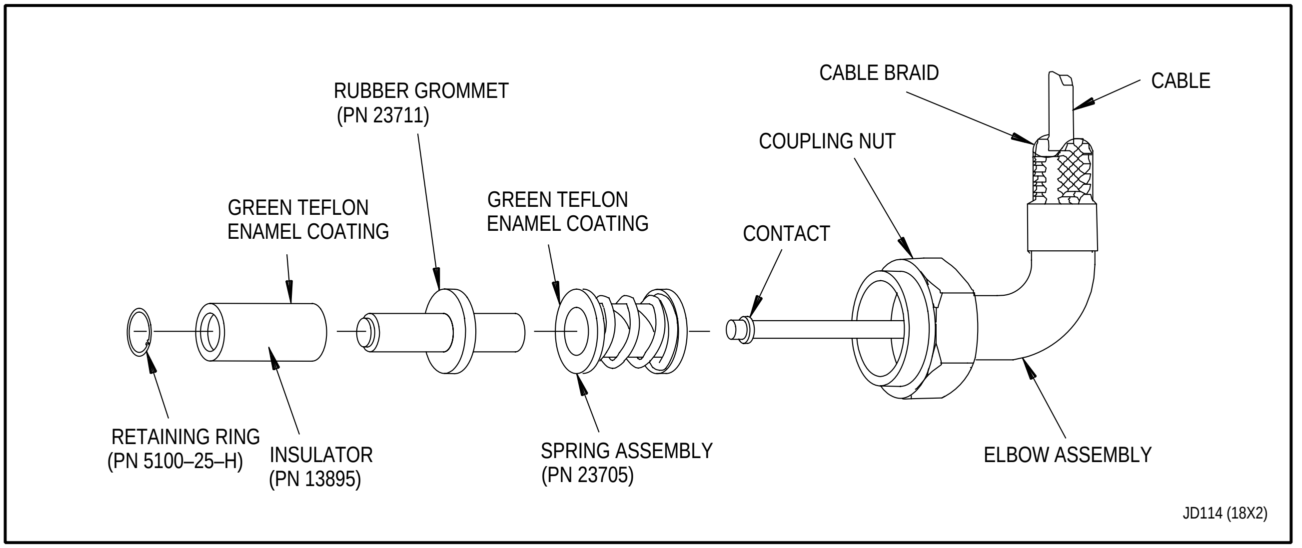


Figure 6. Exciter to Igniter Electrical Power Cables - Assembly

8. EXCITER TO IGNITER ELECTRICAL POWER CABLES - INSTALLATION.
(See Figure 7.)

a. Do not bend special purpose electrical cable less than 5 inches radius.

b. If cable to be installed is a replacement cable, line up cable with old cable. Mark clamp locations on replacement cable. (See paragraph 2.) Remove clamps from old cable, and install on replacement cable as required.

c. Install cables on engine using clamps and hardware (bolts, nuts, spacers, as applicable) that are loosely installed on connecting brackets or adjoining clamps. Put a light coat of PWA 550 antigalling compound on threads of bolts. Tighten nuts fingertight.

d. Remove protective closures from augmentor and main left spark igniters and from receptacles of dual ignition exciter. (See figure 7.)

e. Connect cable connector P30 of exciter to augmentor igniter electrical power cable to augmentor spark igniter and connector P28 to upper rear receptacle of dual ignition exciter. Torque coupling nuts 140 to 160 pound-inches until coupling nut is seated.

CAUTION

Do not use MIL-S-8660C silicone dielectric compound on any oil system hardware. This compound will cause oil foaming.

f. Clean ceramic insulator, contact button, rubber grommet, ignitor well and exciter well with TT-I-735 alcohol.

g. Apply MIL-S-8660C silicone dielectric compound, using solder brush approximately 1/32 inch thick to ceramic insulator and rubber grommet on both ends of main high tension lead, plug connectors P27 and P29. Any compound on end of high tension lead contact should be wiped off.

h. Connect cable connector P27 of exciter to main left igniter electrical power cable to upper forward receptacle of dual ignition exciter and connector P29 to main left spark igniter. Torque coupling nuts 140 to 160 pound-inches until coupling nut is seated.

i. Remove protective closures from augmentor and main right spark igniters and from receptacles of dual ignition exciter.

j. Clean ceramic insulator, contact button, rubber grommet, ignitor well and exciter well with TT-I-735 alcohol.

k. Apply MIL-S-8660C silicone dielectric compound, using solder brush approximately 1/32 inch thick to ceramic insulator and rubber grommet on both ends of main high tension lead, plug connectors P27 and P34. Any compound on end of high tension lead contact should be wiped off.

l. Connect cable connector P27 of exciter to main right igniter electrical power cable to upper rear receptacle of dual ignition exciter and connector P34 to main right spark igniter. Torque coupling nuts 140 to 160 pound-inches until coupling nut is seated.

m. Connect cable connector P28 of exciter to augmentor right igniter electrical cable to upper forward receptacle of dual ignition exciter and connector P35 to augmentor right spark igniter. Torque coupling nuts 140 to 160 pound-inches until coupling nut is seated.

n. Torque nuts on bolts of clamps holding cables in place 27 to 30 pound-inches.

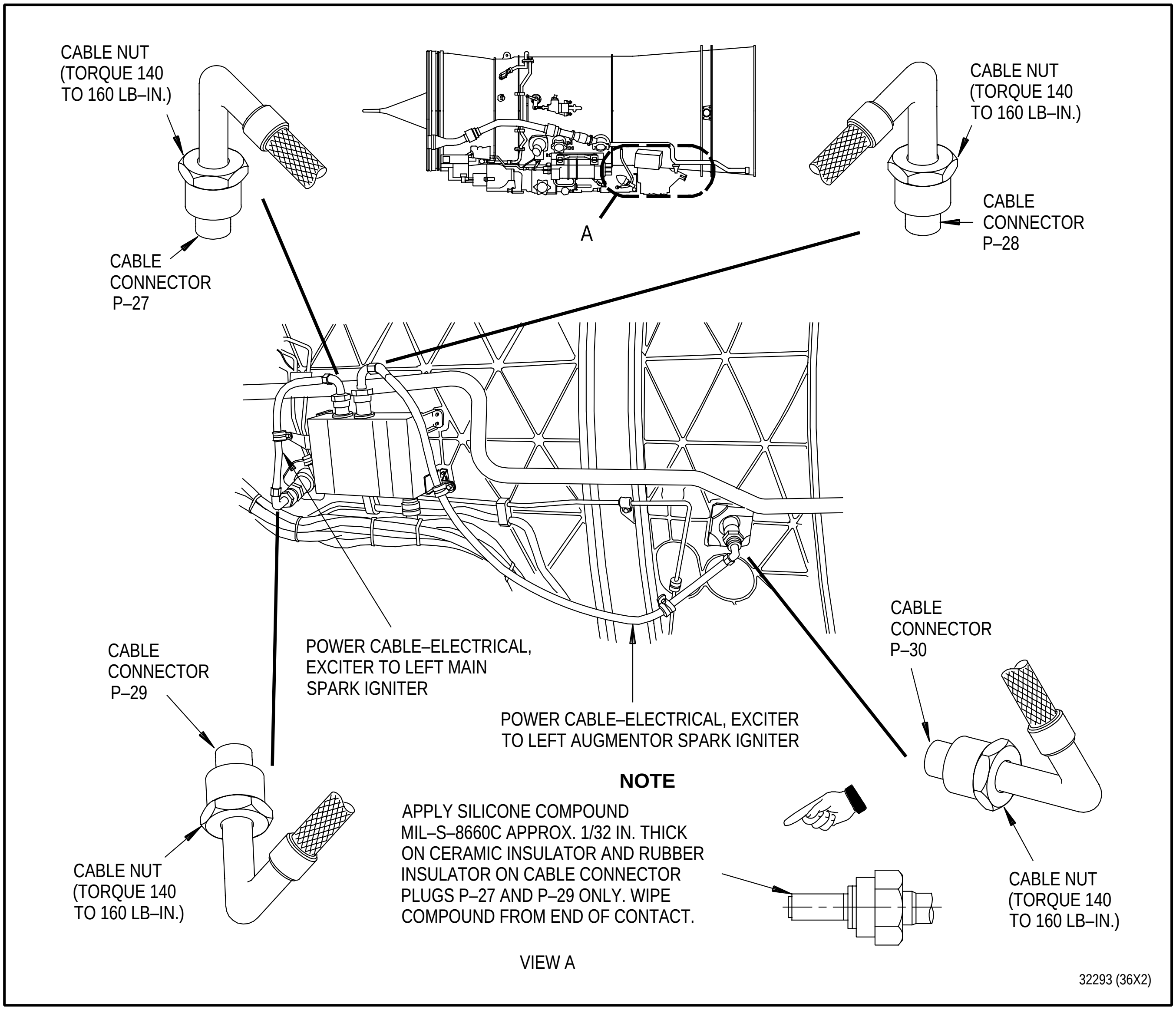


Figure 7. Exciter to Igniter Electrical Power Cables - Installation (Sheet 1 of 2)

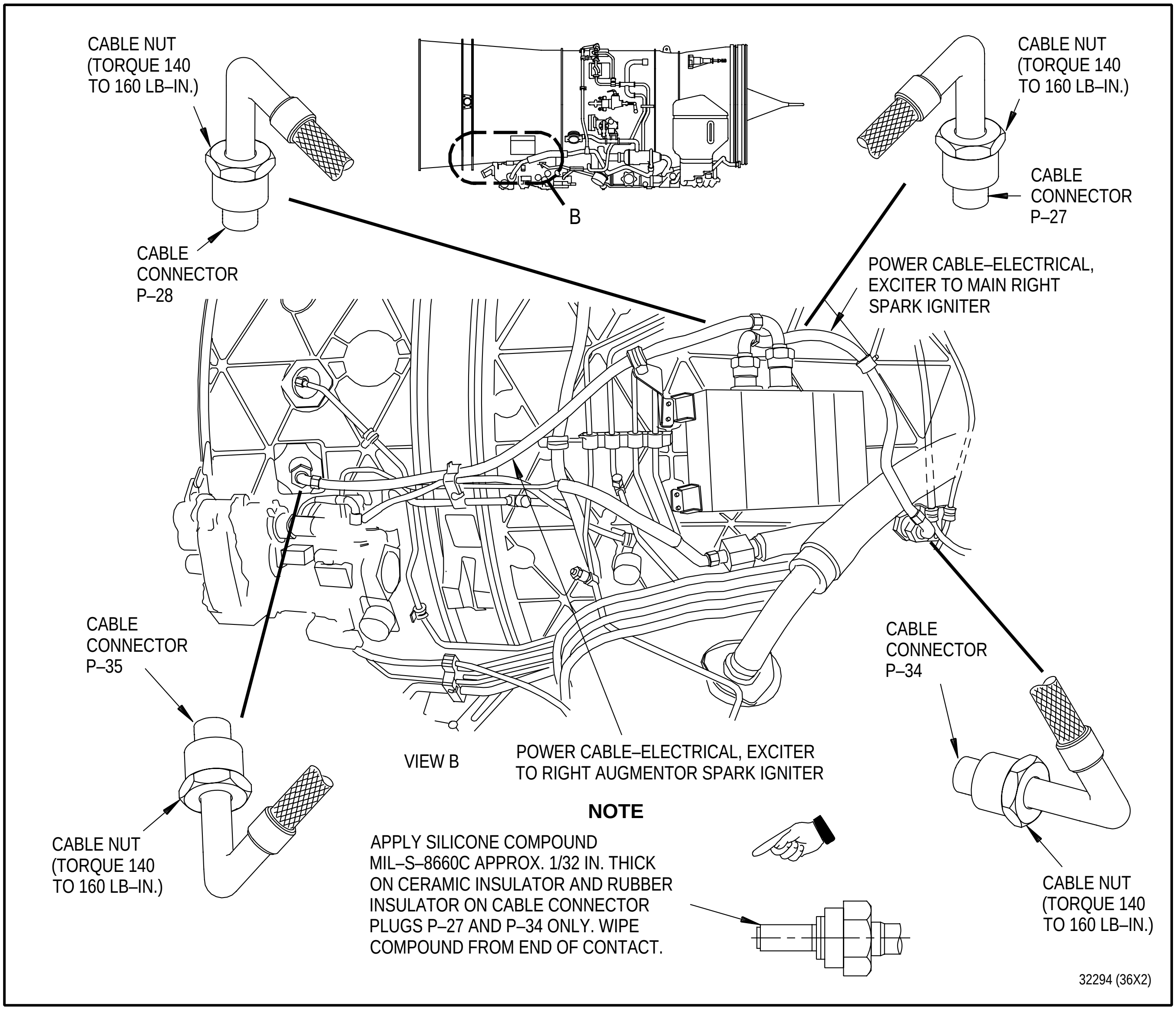


Figure 7. Exciter to Igniter Electrical Power Cables - Installation (Sheet 2 of 2)

WORK PACKAGE

TECHNICAL PROCEDURES

STATOR - GENERATOR

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 10

REFERENCE MATERIAL REQUIRED

None

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

T. O. No.	Date	Level	Title (ECP No.)
T.O.2J-F100229-562	30 SEP 95	O/I	Retrofit of Generator Cable Connector Clamp PN 4082678-01 and Attaching Hardware, F100-PW-229 Engine, F-15/ F-16 Aircraft. (ECP 94QA072)

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
ALCOHOL, ISOPROPYL	TT-I-735 GRADE A, OR PMC 9016
CLOTH, LINT-FREE	-
LOCKWIRE(0.032 INCH DIAMETER)	MS9226-04
MATERIAL, BARRIER	MIL-B-121, TYPE II, GRADE A, CLASS 1 OR 2
OIL, LUBRICATING	MIL-L-7808 OR
PETROLATUM (ALTERNATE TO OIL)	VV-P-236
SOLVENT, DIELECTRIC	PMC 8910
SOLVENT, PETROLEUM	P-D-680, TYPE II

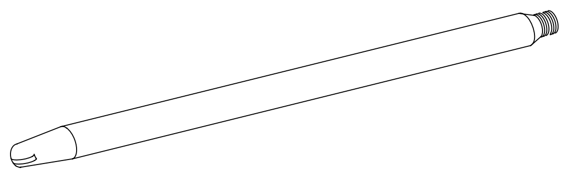
EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
PACKING, PREFORMED	MS9388-154	1

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
2,5	Generator Stator - Removal/Installation	
	Pin, Aligning, Generator Stator (3 required) -	PWA 52353

ILLUSTRATED SUPPORT EQUIPMENT



PWA 52353 –C

Figure T1. PWA 52353 Aligning Pin

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures on the generator stator:

- Removal
- Cleaning
- Inspection
- Installation
- Storage and shipment

2. GENERATOR STATOR - REMOVAL.

(See Figure 1.)

a. Remove generator stator. (See figure 1.)

3. GENERATOR STATOR - CLEANING.

a. Clean exterior metallic surfaces with P-D-680, Type II petroleum solvent. Avoid saturation of connector grommets and take care to prevent solvent entry into stator windings and reactor assemblies.

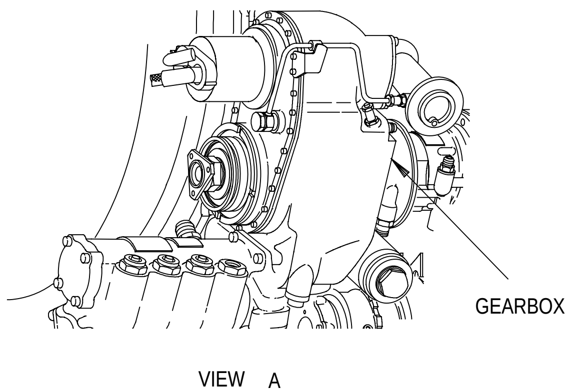
CAUTION

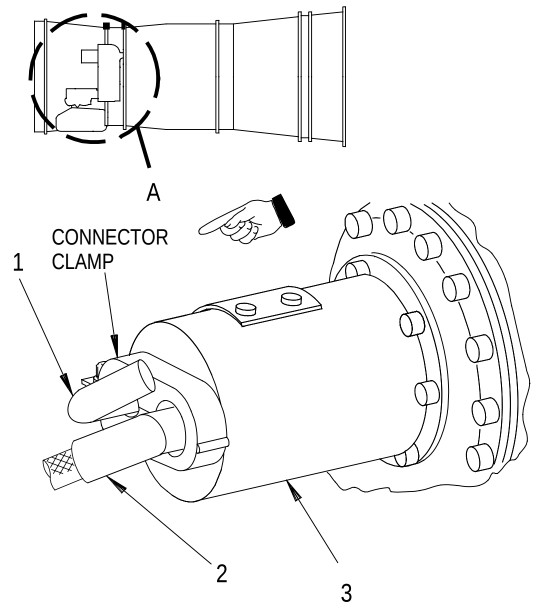
Care should be taken not to damage finish of pole faces.

b. Clean interior of stator housing with low pressure compressed air and wipe clean with dry lint-free cloth moistened with isopropyl alcohol TT-I-735 Grade A, or PMC 9016, or dielectic solvent PMC 8910. Blow dry, if necessary, with clean air at 30 psi or less. Care should be taken not to damage finish of pole faces.

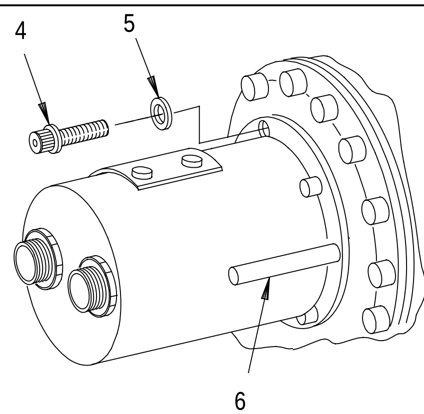
a. REMOVE GENERATOR CABLE CONNECTOR CLAMP (AFTER TCTO 2J–F100229–562).

b. DISCONNECT CABLE CONNECTORS P118 (1) AND P119 (2) FROM GENERATOR STATOR (3). INSTALL PROTECTIVE CLOSURES.

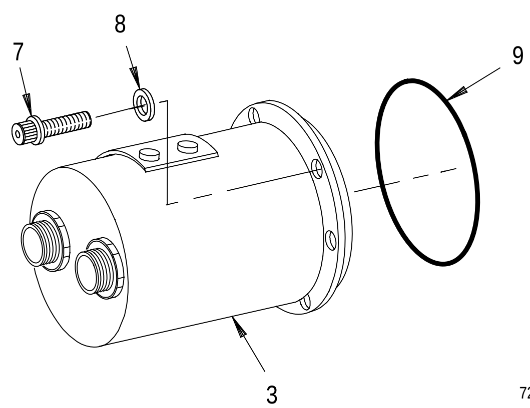




c. REMOVE EVERY OTHER BOLT (4) AND WASHER (5). INSTALL PWA 52353 PINS (6) IN BOLTHOLES.



d. REMOVE THREE REMAINING BOLTS (7) AND WASHERS (8).
e. CAREFULLY MOVE STATOR (3) FORWARD OFF ROTOR AND PINS.
f. REMOVE AND DISCARD PACKING (9).
g. REMOVE TOOLING



72621 (48X2)

Figure 1. Generator Stator - Removal

4. GENERATOR STATOR - INSPECTION.
(See Figure 2.)

a. Inspect generator stator.
(See figure 2.)

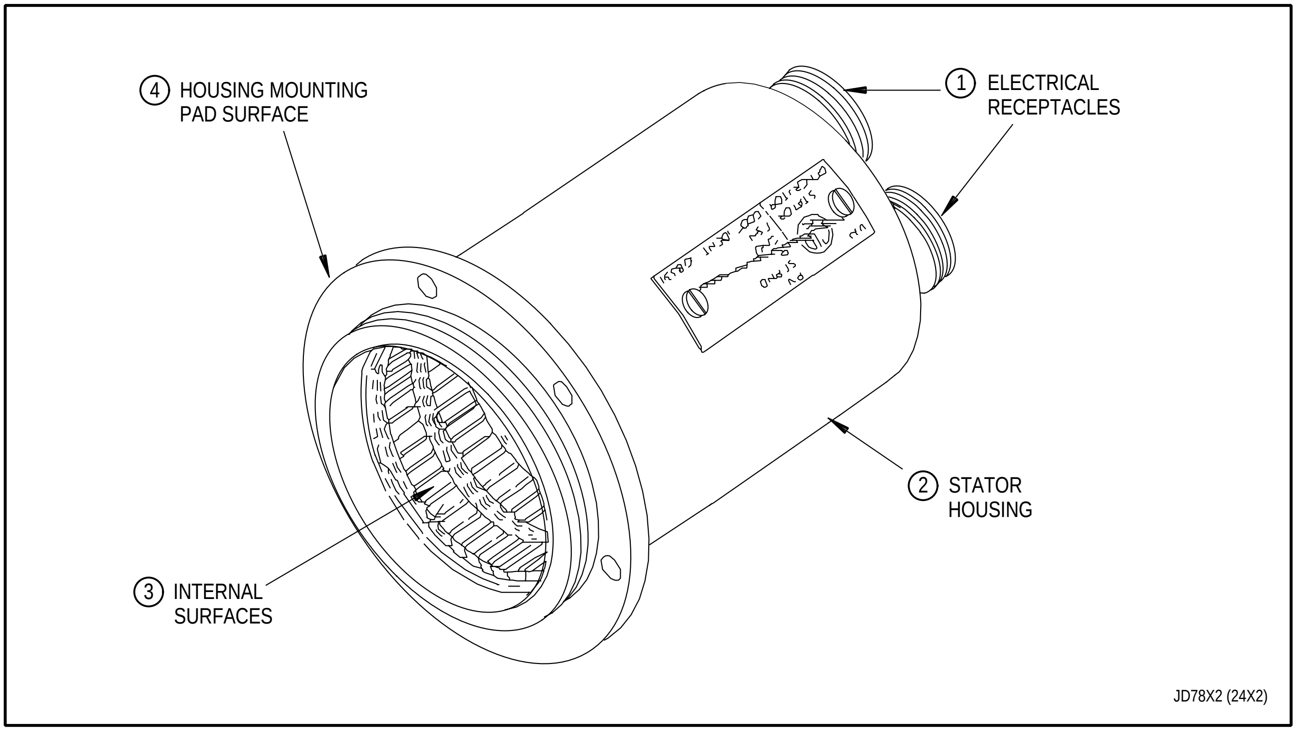


Figure 2. Generator Stator - Inspection

Legend for figure 2

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Electrical receptacles -			
Cracks	Not serviceable	Not reparable	Replace generator stator.
Stripped or missing threads	Not serviceable	Not reparable	Replace generator stator.
Burned, broken or recessed sockets	Not serviceable	Not reparable	Replace generator stator.
2. Stator housing -			
Cracks, nicks, dents and chafing wear	Exposed metal not allowed	0.060 inch depth	Exposed metal marks not exceeding 0.060 inch depth shall be painted with flat black enamel. Replace generator stator if distress depth exceeds 0.060 inch.
3. Internal surfaces -			
Scratches	Slight surface scratches	Not reparable	Replace generator stator.
4. Housing mounting pad surface -			
Crack, nicks and dents	None allowed in original seal area	Not reparable	Replace generator stator.

5. GENERATOR STATOR - INSTALLATION. (See Figures 3 and 4.)

a. Inspect magnetic surface of generator rotor for foreign objects. (See figure 3.) Remove if present before installing generator stator.

b. Lubricate PN MS9388-154 packing with a light coat of MIL-L-7808 oil or VV-P-236 petrolatum.

c. Install generator stator. (See figure 4.)

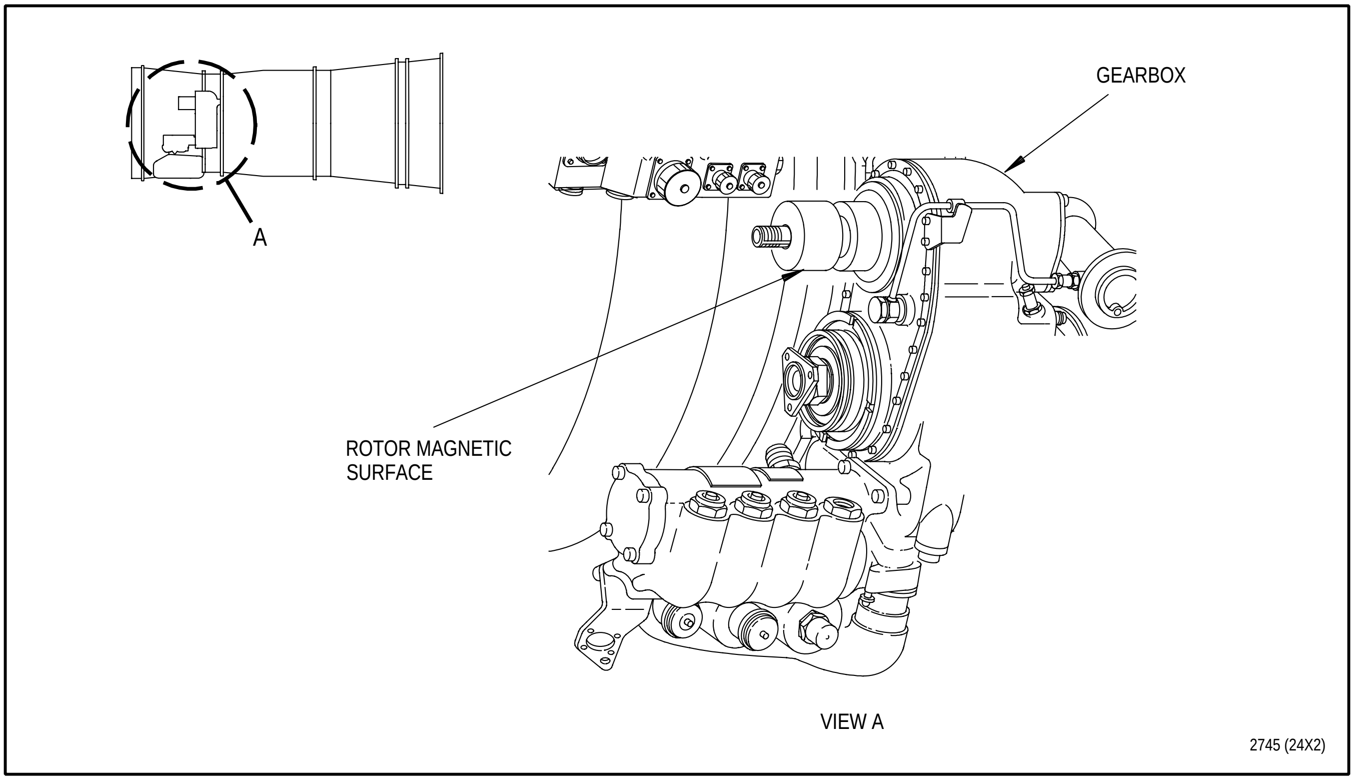


Figure 3. Generator Rotor - Inspection

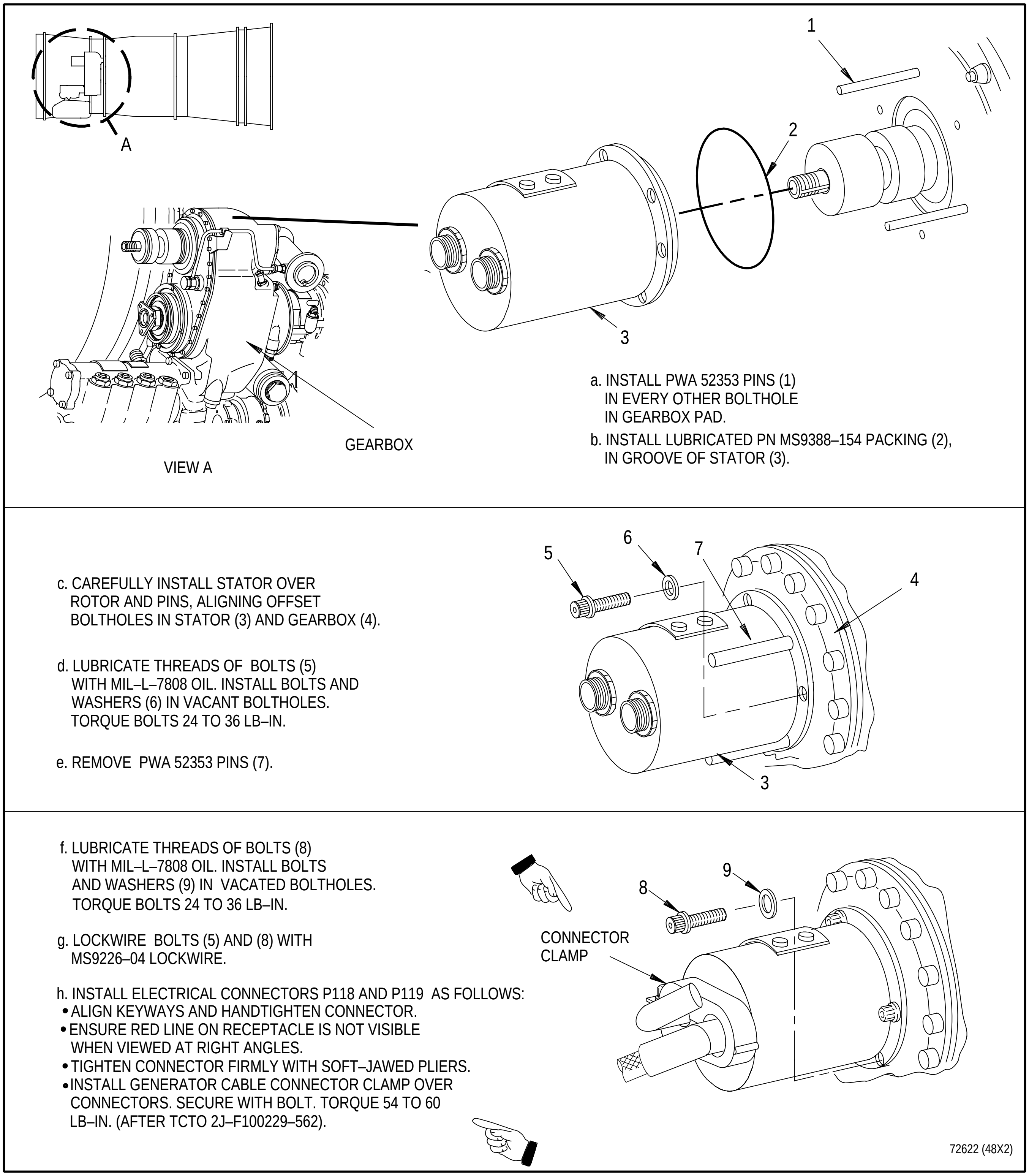


Figure 4. Generator Stator - Installation

6. GENERATOR STATOR - STORAGE AND SHIPMENT.

a. Clean exterior metallic surfaces of generator stator with P-D-680, Type II petroleum solvent. Avoid saturation of connector grommets and take care to prevent solvent entry into stator windings and reactor assemblies. Dry with clean, dry, lint-free cloth.

b. Clean interior of stator housing with low pressure compressed air and wipe clean with lint-free cloth moistened with isopropyl alcohol TT-I-735 Grade A, or PMC 9016, or dielectic solvent PMC 8910. Blow dry, if necessary, with clean air at 30 psi or less. Care should be taken not to damage finish of pole faces.

c. Store stator in a container.

d. If stator is to be shipped, wrap in barrier material, MIL-B-121, Type II, Grade A, Class 1 or 2 or equivalent and pack in a container. Ensure that it is cushioned with shock absorbant packing material to protect it from rough handling during shipment.

WORK PACKAGE

TECHNICAL PROCEDURES

ROTOR - GENERATOR

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 12

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2	21	5	17	7 - 10	0
3	17	6	21	11	17
4	0			12	21

REFERENCE MATERIAL REQUIRED

None

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

T. O. No.	Date	Level	Title (ECP No.)
T.O.2J-F100229-562	30 SEP 95	O/I	Retrofit of Generator Cable Connector Clamp PN 4082678-01 and Attaching Hardware, F100-PW-229 Engine, F-15/ F-16 Aircraft. (ECP 94QA072)

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
ALCOHOL, ISOPROPYL	TT-I-735 GRADE A, OR PMC 9016
BRUSH, NONMETALLIC	-
CLOTH, LINT-FREE	-
LOCKWIRE(0.032 INCH DIAMETER)	MS9226-04
MATERIAL, BARRIER	MIL-B-121, TYPE II, GRADE A, CLASS 1
OIL, LUBRICATING	MIL-L-7808 OR
PETROLATUM	VV-P-236
POWDER, MOLYBDENUM DISULFIDE	MIL-M-7866
SOLVENT, DIELECTRIC	PMC 8910

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
KEY WASHER	2147889	1
PACKING, PREFORMED	MS9388-154	1

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
2	PRELIMINARY INSTRUCTIONS	
	PIN, ALIGNING, STATOR GENERATOR - - - - - - - - - - - - -	PWA 52353
3	GENERATOR ROTOR - REMOVAL	
	HOLDER, POWER TAKE OFF DRIVESHAFT - - - - - - - - - - - -	PWA 50433
	WRENCH, GENERATOR ROTOR RETAINING NUT - - - - - - - - -	PWA 51798
	PULLER, GENERATOR ROTOR -	PWA 52360

APPLICABLE SUPPORT EQUIPMENT (continued)

Paragraph	Function - Tool Nomenclature	Tool Number
6	GENERATOR ROTOR - INSTALLATION	
	HOLDER, POWER TAKE OFF DRIVESHAFT ------------	PWA 50433
	WRENCH, GENERATOR ROTOR RETAINING NUT ---------	PWA 51798
7	FOLLOW-ON MAINTENANCE	
	PIN, ALIGNING, STATOR GENERATOR -------------	PWA 52353

ILLUSTRATED SUPPORT EQUIPMENT

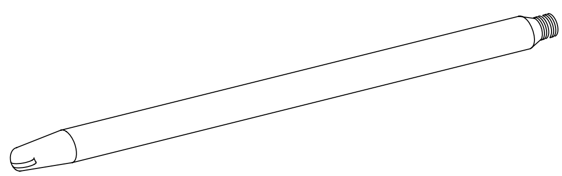


Figure T1. PWA 52353 Aligning Pin

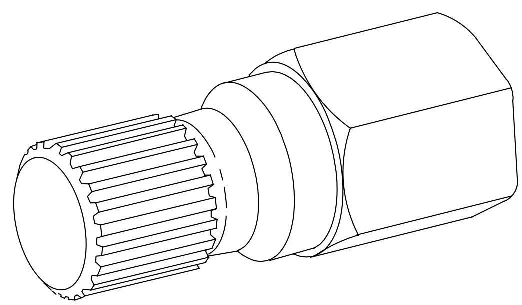


Figure T2. PWA 50433 Holder

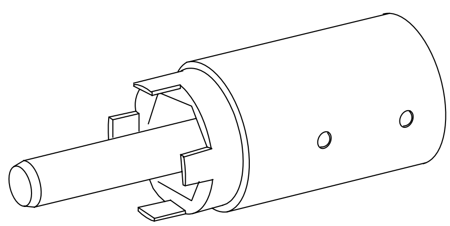


Figure T3. PWA 51798 Wrench

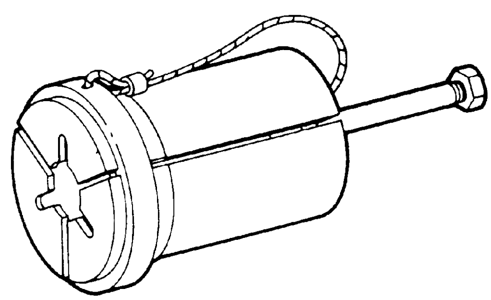


Figure T4. PWA 52360 Puller

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures on the generator rotor:

- Preliminary instructions
- Removal
- Cleaning
- Inspection
- Installation
- Follow-on maintenance
- Storage and shipment

2. PRELIMINARY INSTRUCTIONS.

(See Figure 1.)

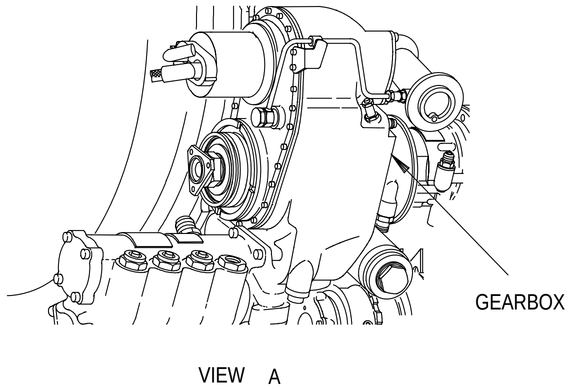
NOTE

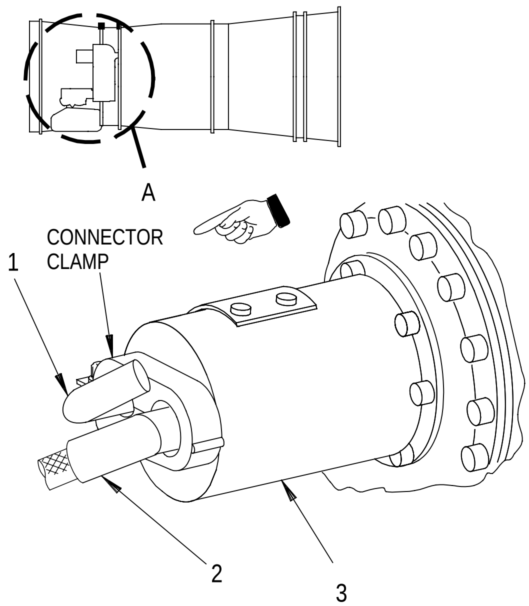
Generator stator is removed for access to generator rotor.

a. Remove generator stator. (See figure 1.)

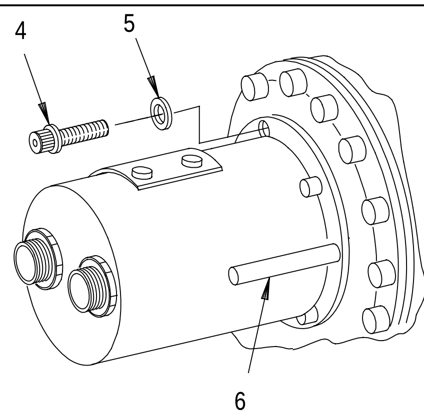
a. REMOVE GENERATOR CABLE CONNECTOR CLAMP (AFTER TCTO 2J–F100229–562).

b. DISCONNECT CABLE CONNECTORS P118 (1) AND P119 (2) FROM GENERATOR STATOR (3). INSTALL PROTECTIVE CLOSURES.





c. REMOVE EVERY OTHER BOLT (4) AND WASHER (5). INSTALL PWA 52353 PINS (6) IN BOLTHOLES.



d. REMOVE THREE REMAINING BOLTS (7) AND WASHERS (8).
e. CAREFULLY MOVE STATOR (3) FORWARD OFF ROTOR AND PINS.
f. REMOVE AND DISCARD PACKING (9).
g. REMOVE TOOLING

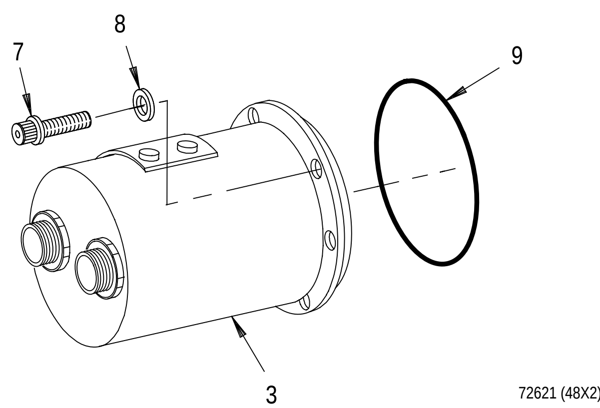


Figure 1. Generator Stator - Removal

3. GENERATOR ROTOR - REMOVAL.

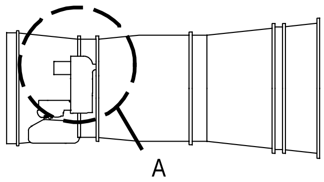
(See Figure 2.)

a. Remove generator rotor. (See Figure 2.)

4. GENERATOR ROTOR - CLEANING.

a. Clean generator rotor and retaining nut by wiping with clean, lint-free cloth moistened with isopropyl alcohol TT-I-735 Grade A, or PMC 9016, or dielectric solvent PMC 8910. Blow dry, if necessary, with clean air at 30 psi or less.

b. Stubborn foreign particles may be removed with stiff, nonmetallic brush, and low pressure compressed air at less than 30 psig.



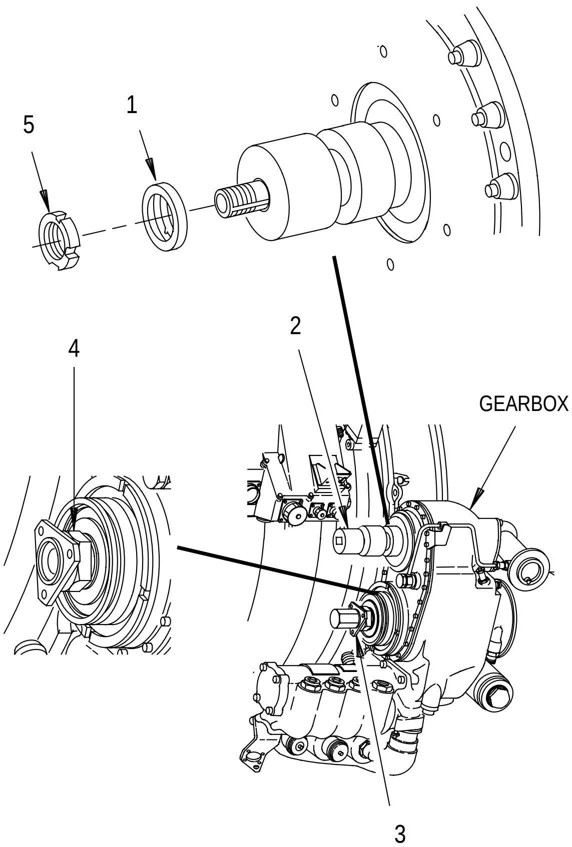
a. REMOVE CRIMPS FROM KEY WASHER (1)

NOTE

IF REMOTE GEARBOX DRIVESHAFT COUPLING IS INSTALLED ON GEARBOX, DO NOT INSTALL PWA 50433 HOLDER.

b. INSTALL PWA 51798 WRENCH (2) AND PWA 50433 HOLDER (3).

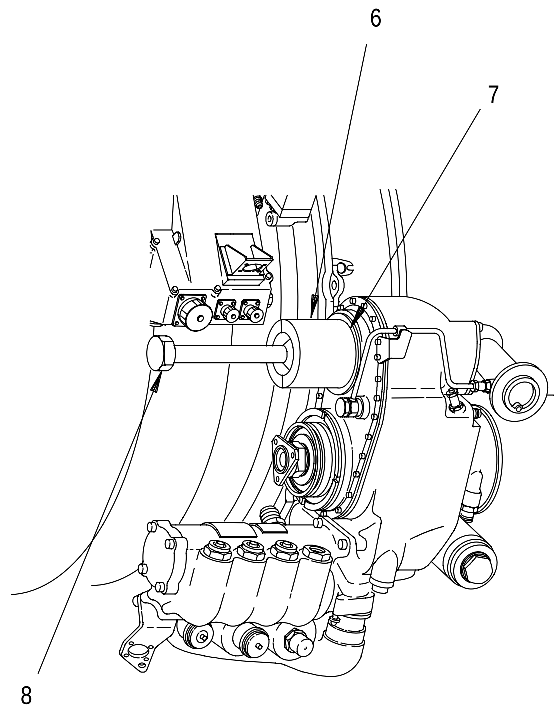
c. USING STANDARD WRENCHES, HOLD PWA 50433 HOLDER (3) OR HOLD REMOTE GEARBOX DRIVESHAFT COUPLING HEX (4). REMOVE ROTOR RETAINING NUT (5). DISCARD KEY WASHER (1).



d. INSTALL PWA 52360 PULLER (6) OVER ROTOR. POSITION JAWS BEHIND REAR FACE OF ROTOR. LOCK IN POSITION WITH RING DETAIL (7).

e. THREAD IN SCREW DETAIL (8) TO FREE ROTOR FROM SHAFT.

f. REMOVE TOOLING.



2748 (48X2)

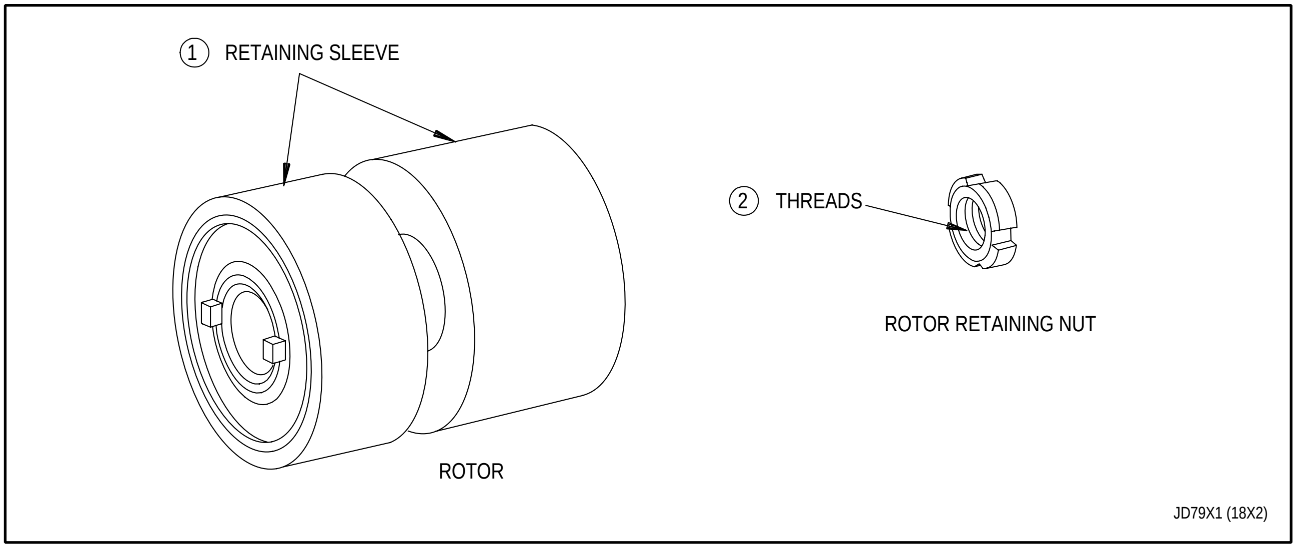
Figure 2. Generator Rotor - Removal

5. GENERATOR ROTOR - INSPECTION.
(See Figure 3.)

a. Inspect generator rotor. (See figure 3.)

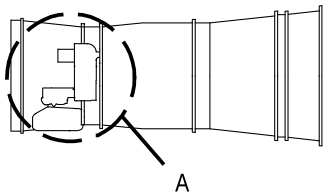
6. GENERATOR ROTOR - INSTALLATION.
(See Figure 4.)

a. Install generator rotor. (See figure 4.)



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Retaining sleeve -			
Rubbing, uneven wear	Not serviceable	Not reparable	Replace generator rotor.
Loose, warped, cracked	Not serviceable	Not reparable	Replace generator rotor.
Scratches	Slight surface scratches	Not reparable	Replace generator rotor.
2. Retaining nut threads -			
Damaged	Not serviceable	Not reparable	Replace retaining nut.

Figure 3. Generator Rotor and Retaining Nut - Inspection



a. INSTALL ROTOR (1) ON GEARBOX DRIVESHAFT ENGAGING LUGS ON ROTOR IN SLOTS OF DRIVESHAFT.

b. APPLY LIGHT FILM OF LUBRICANT MIXTURE 75% MIL–L–7866 MOLYBDENUM DISULFIDE POWDER AND 25% MIL–L7808 OIL TO INNER FACE OF PN 2147889 KEY WASHER (2) AND INSTALL ON DRIVESHAFT (3).

c. LUBRICATE THREADS OF DRIVESHAFT WITH MIL–L–7808 OIL, AND INSTALL NUT (4).

d. TURN KEY WASHER (2) CLOCKWISE (CW), AS VIEWED FROM FRONT OF ENGINE, SO THAT TABS ARE AGAINST SIDES OF SLOTS IN DRIVESHAFT. MARK ALIGNMENT ON KEY WASHER AND ROTOR.

NOTE

IF REMOTE GEARBOX DRIVESHAFT COUPLING IS INSTALLED ON GEARBOX, DO NOT INSTALL PWA 50433 HOLDER.

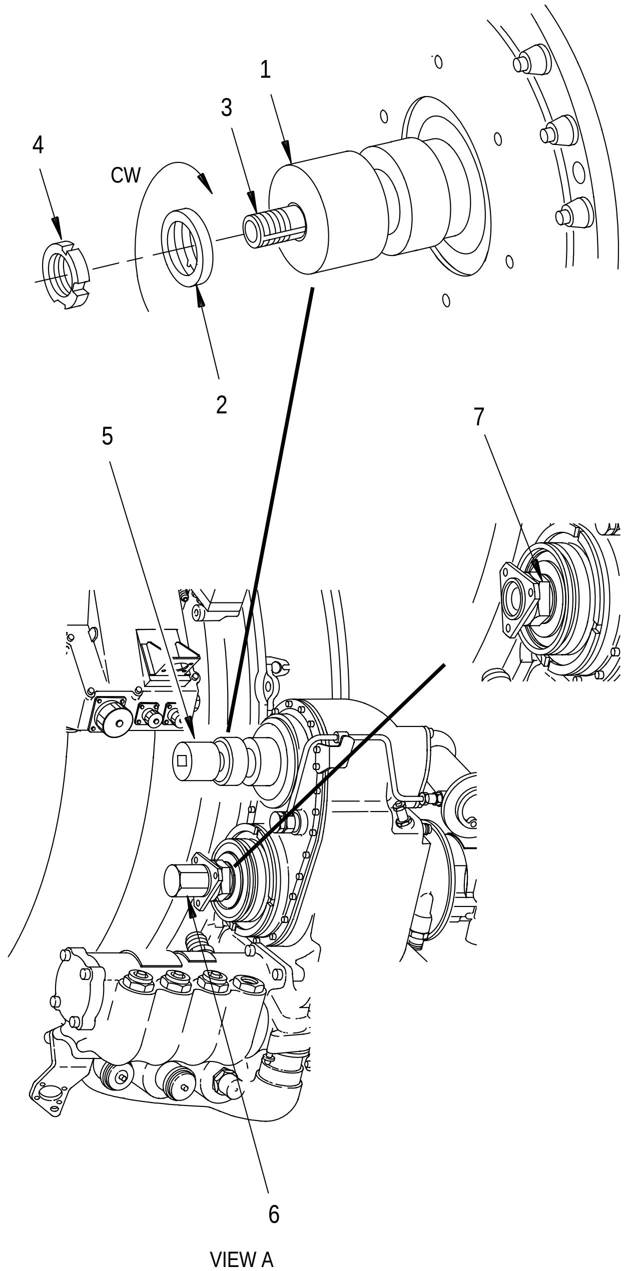
e. INSTALL PWA 51798 WRENCH (5) AND PWA 50433 HOLDER (6).

f. USING STANDARD WRENCHES, HOLD PWA 50433 HOLDER (6) OR HOLD REMOTE GEARBOX DRIVESHAFT COUPLING HEX (7). TORQUE NUT (4) 250 TO 300 LB–IN.

g. CHECK ALIGNMENT MARKS ON WASHER AND ROTOR.

h. IF MARKS ARE NOT IN LINE, REMOVE NUT AND INSPECT KEY WASHER FOR BENT, CRACKED, OR MISSING TABS. REPEAT STEPS b. THROUGH f., USING NEW KEY WASHER AS NECESSARY.

i. IF MARKS ARE IN LINE, CRIMP KEY WASHER INTO NUT SLOTS, TWO PLACES, 180 DEGREES APART.



2749

Figure 4. Generator Rotor - Installation

7. FOLLOW-ON MAINTENANCE.

(See Figures 5 and 6.)

a. Inspect magnetic surface of generator rotor for foreign objects. (See figure 5.) Remove if present before installing generator stator.

b. Lubricate PN MS9388-154 packing with a light coat of MIL-L-7808 oil, or VV-P-236 petrolatum.

c. Install generator stator. (See figure 6.)

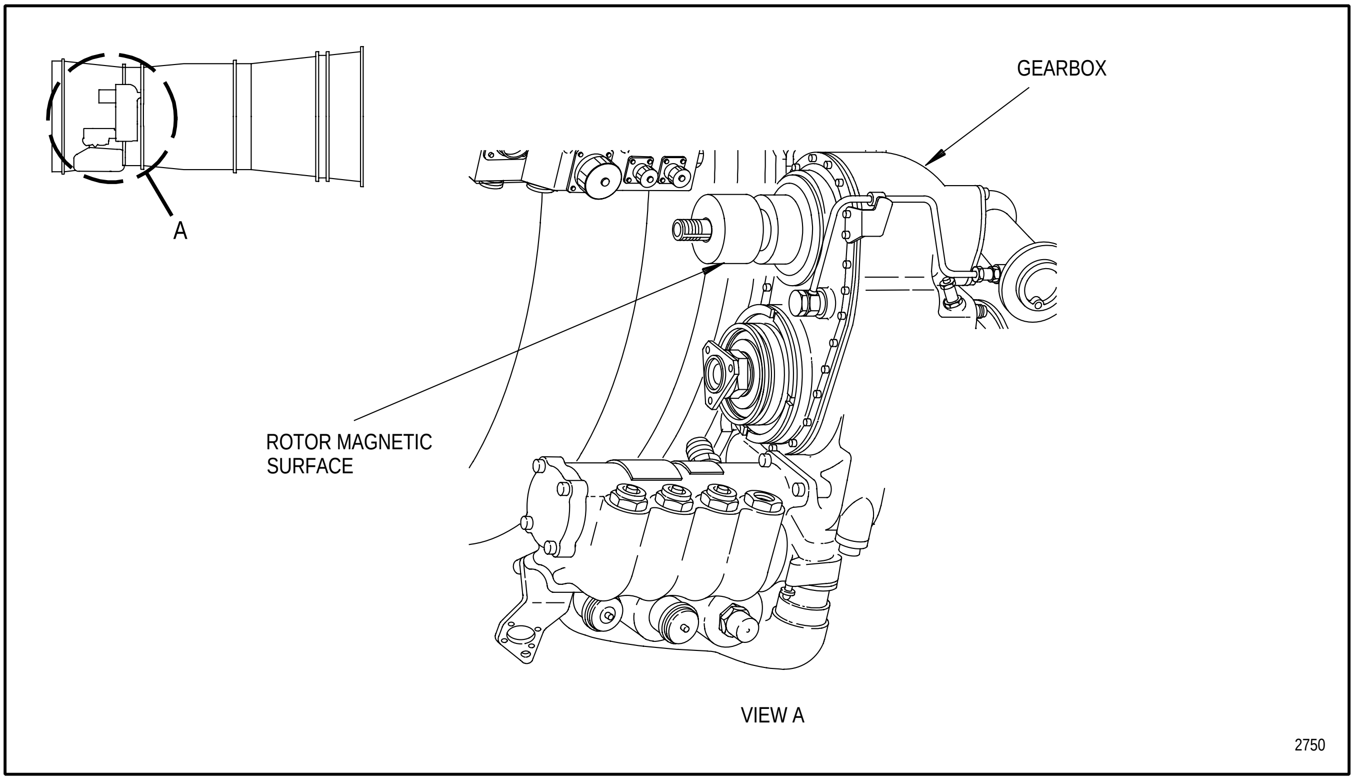


Figure 5. Generator Rotor - Surface Inspection

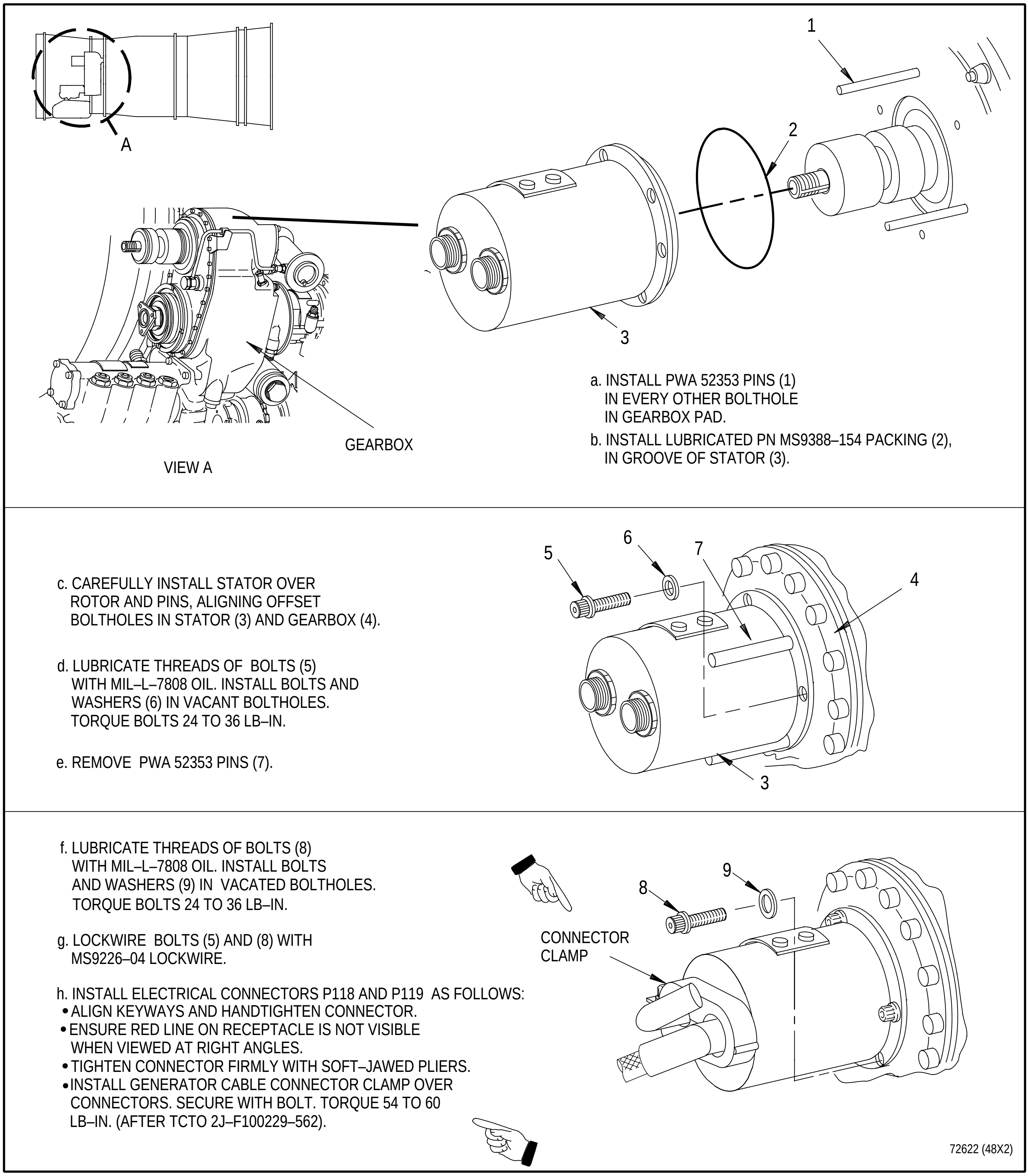


Figure 6. Generator Stator - Installation

8. GENERATOR ROTOR - STORAGE AND SHIPMENT.

a. Clean generator rotor by wiping with clean, dry, lint-free cloth moistened with isopropyl alcohol TT-I-735 Grade A, or PMC 9016, or dielectric solvent PMC 8910. Blow dry, if necessary, with clean air at 30 psi or less.

b. Stubborn foreign particles may be removed with stiff, nonmetallic brush, and low pressure compressed air at less than 30 psig.

c. Store rotor in nonmetallic container.

d. If rotor is to be shipped, wrap it in barrier material, MIL-B-121, Type II, Grade A, Class 1, or equivalent and pack it in a container. Ensure that it is cushioned with shock absorbent packing material to protect it from rough handling during shipment.

WORK PACKAGE

TECHNICAL PROCEDURES

DIAGNOSTIC UNIT - ENGINE

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 16

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	22	4	10	12	22
2	10	5 - 11	7	13 - 16	7
3	7				

REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information	T.O. 2J-F100-53-1
General Intermediate Maintenance Procedures	WP 021 00
Maintenance Instructions	T.O. 2J-F100-53-5
Cable, Hose, Tube and Manifold Assemblies -Engine External	WP 064 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Alcohol, denatured	O-E-760, Type II or
Trichloroethane inhibited-1,1,1	O-T-620
Alcohol, isopropyl	TT-I-735
Cloth, dry lint-free	-
Compound, antigalling (PWA 550)	Hi-T-650 or Lubri-Bond HT
Compound, retaining	Loctite, grade EV
Compound, primer	Locquic, primer T
Film, polyethylene	0.006 inch thick
Grease, silicone	DC 4
Lockwire (0.032 inch diameter)	MS9226-04
Oil, lubricating	MIL-L-7808
Solvent, petroleum	P-D-680, Type II or III
Tape, electrical insulating	Plastic
Tape, moisture-proof	PPP-T-60, Type III, Class I

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Packing, preformed	MS9966-04	1
Packing, preformed	MS9966-05	1
Strap	MS3367-4-9	3

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
11	Engine Diagnostic Unit, Interconnect Board Assembly - Removal and Installation Pin - Socket Insertion and Removal Tool - - - - - - - - - - -	AMP MS24256R16 AMP MS24256R20 AMP MS27534-20

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures for the engine diagnostic unit:

- Removal
- Purging and removal of attaching parts
- Cleaning
- Inspection
- Installation of attaching parts
- Installation
- Pressure relief valve - Removal and installation
- Storage and shipment

2. ENGINE DIAGNOSTIC UNIT - REMOVAL.

(See Figure 1.)

a. Remove bolts securing electrical connector bracket with receptacle J1 to engine diagnostic unit (EDU). (See figure 1.)

b. Disconnect hinged cushioned loop clamp securing red and violet cables at P70 connector.

c. Disconnect hinged cushioned loop clamp securing violet cable at front lower EDU bracket.

d. Disconnect cable connectors P48, P50, P51, P70, and P121 from EDU.

CAUTION

- Exercise care when removing tube, hose and manifold assemblies to prevent scratches, nicks and dents. Do not exert force or pressure on tube to cause tube to bend or distort when loosening tube coupling nuts, fastening bolts and nuts. Do not use tubes as hand support or foot rest.
- Two wrenches shall be used to remove tubes. Hold mating tube adapter or tube coupling with one wrench while turning coupling nut with second wrench.
- Ensure there is no twisting stress on tube, hose or manifold during removal.

e. Remove fuel coolant inlet and outlet tubes per 2J-F100-53-5, WP 064 00.

f. Cap all open fuel lines, ports, and electrical connectors.

g. Support EDU and remove bolts securing EDU to rear upper and lower brackets.

h. Remove bolts securing EDU to front upper and lower brackets.

i. Remove EDU from engine.

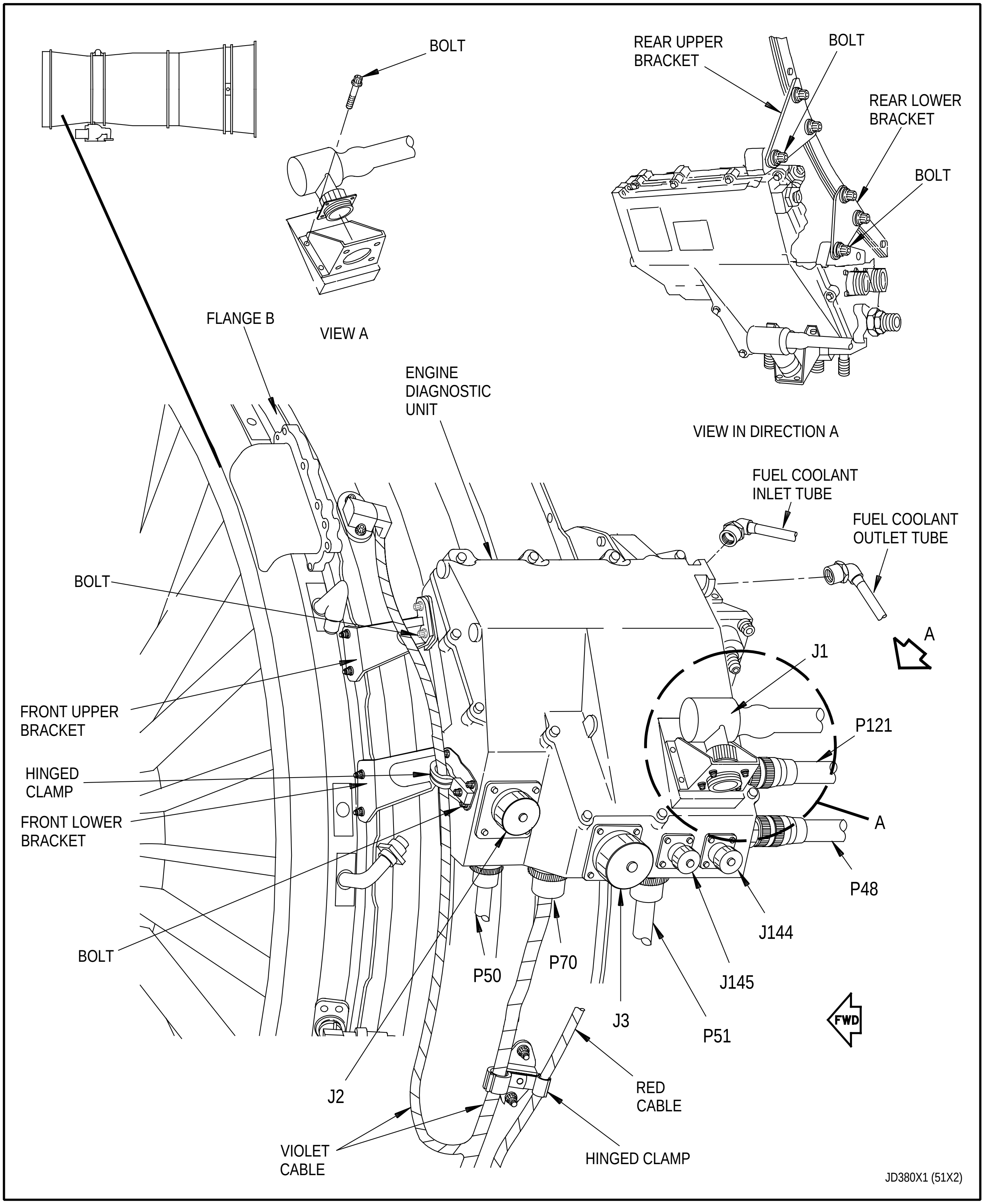


Figure 1. Engine Diagnostic Unit - Removal

3. ENGINE DIAGNOSTIC UNIT - PURGING AND REMOVAL OF ATTACHING PARTS.

(See Figure 2.)

CAUTION

- Engine diagnostic unit (EDU) shall only be opened by authorized engine personnel, or damage to internal electronic components may occur.
- This equipment contains electronic parts sensitive to damage by Electrostatic Discharge (ESD). These electronic parts are identified by the ESD symbol ♁ . Observe ESD precautions and handling procedures contained in T.O. 00-25-234 when touching, removing, or inserting parts or assemblies.

a. Remove protective closures from fuel ports.

b. Connect a hose to fuel outlet port to collect residual fuel. Apply dry, filtered air or nitrogen at 25 to 30 psig to fuel inlet port. Purge for approximately 3 minutes.

c. Remove hose from fuel outlet port.

d. Remove adapters from fuel inlet and outlet ports. Discard packings.

e. Install protective closures in fuel ports.

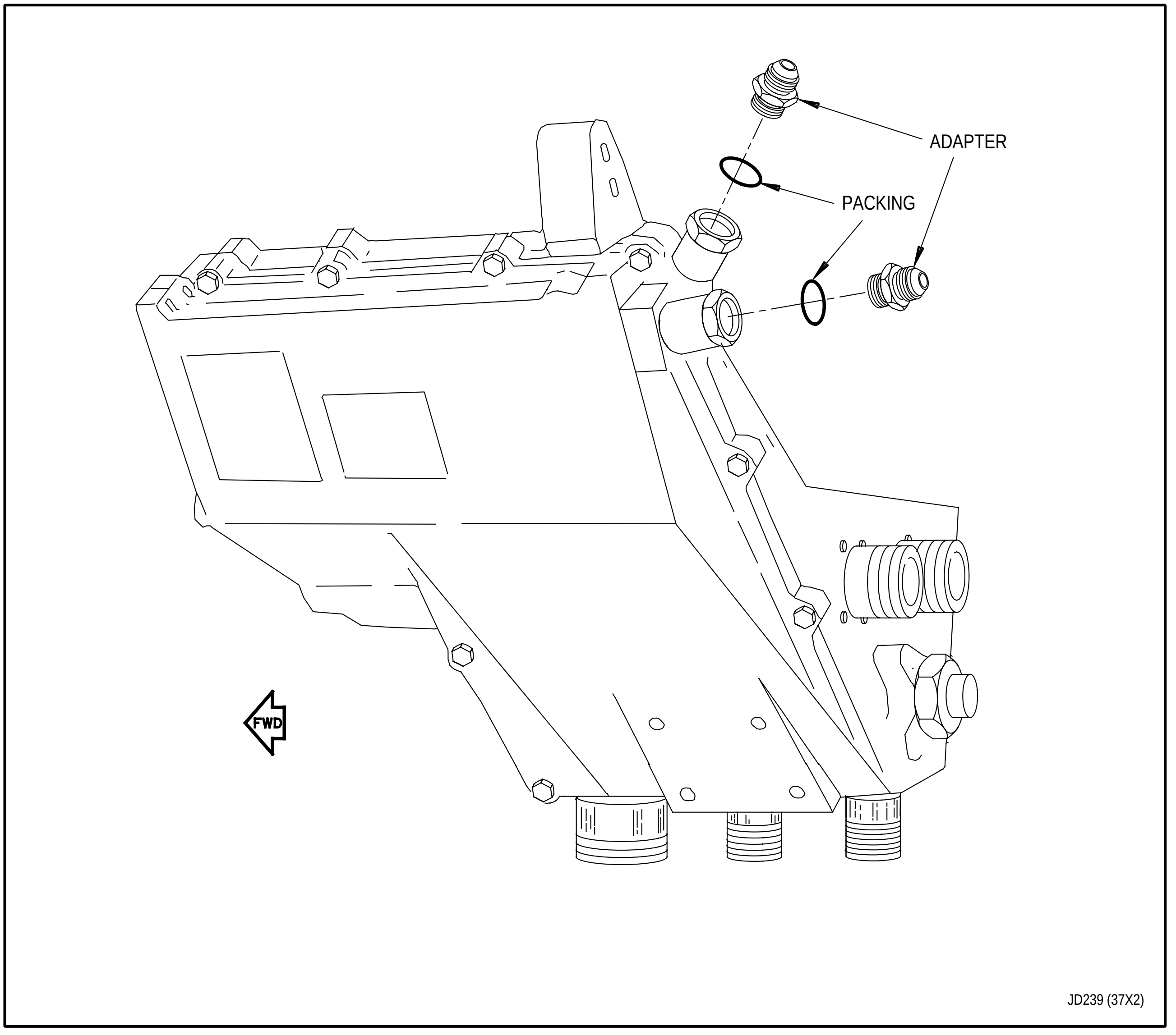


Figure 2. Engine Diagnostic Unit - Removal of Attaching Parts

4. ENGINE DIAGNOSTIC UNIT - CLEANING.

a. Using a clean, dry cloth moistened with isopropyl alcohol, wipe exterior of EDU.

b. Remove protective closures from electrical connectors. Clean connector pins, sockets, and cable insulation with O-E-760, Type II alcohol or O-T-620 Trichloroethane inhibited-1,1,1. Dry connectors with clean, compressed air at less than 30 psig. Replace protective caps.

5. ENGINE DIAGNOSTIC UNIT - INSPECTION. (See Figure 3.)

a. Inspect EDU. (See figure 3.)

b. Inspect electrical connectors for bent pins. Refer to T.O. 2J-F100-53-1, WP 021 00.

c. Inspect mounting supports for cracks and looseness.

d. Inspect bolts used to secure EDU to supports for wear and damage.

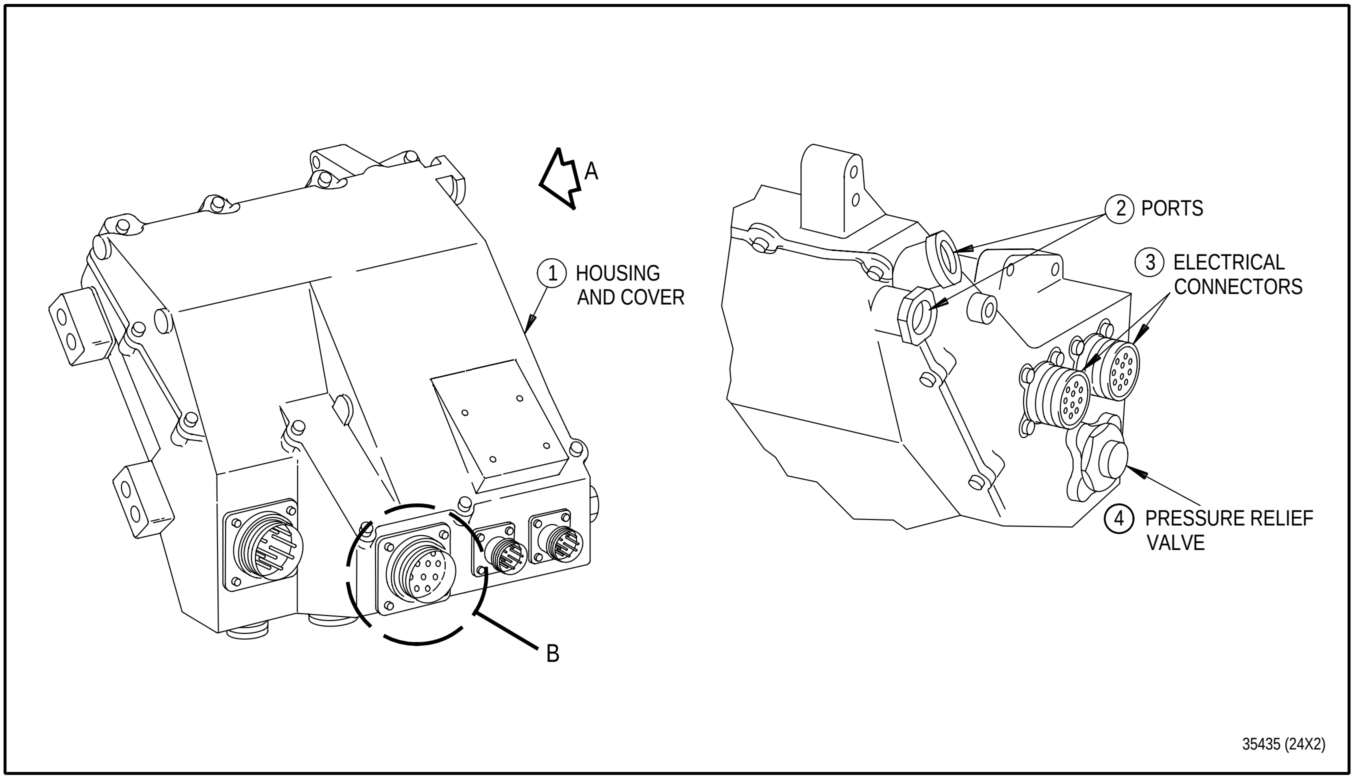


Figure 3. Engine Diagnostic Unit - Inspection

Legend for figure 3

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Housing and cover -			
Scratches and gouges	Shallow scratches and gouges allowed	Not reparable	Replace engine diagnostic unit.
Cracks	Not serviceable	Not reparable	Replace engine diagnostic unit.
2. Ports -			
Threads stripped, damaged, or missing	Not serviceable	Not reparable	Replace engine diagnostic unit.
3. Electrical connectors -			
Threads broken or dented	Not serviceable	Not reparable	Replace engine diagnostic unit.
4. Pressure relief valve -			
Insecure mounting, cracked or missing water guard cap or spring clip	Not serviceable	Not reparable	Replace valve.

6. ENGINE DIAGNOSTIC UNIT - INSTALLATION OF ATTACHING PARTS.
(See Figure 4.)

a. Lubricate packings with MIL-L-7808 oil, and install on adapters.

b. Lubricate threads of adapters with MIL-L-7808 oil.

c. Install adapters in ports of engine diagnostic unit, and torque. (See figure 4.)

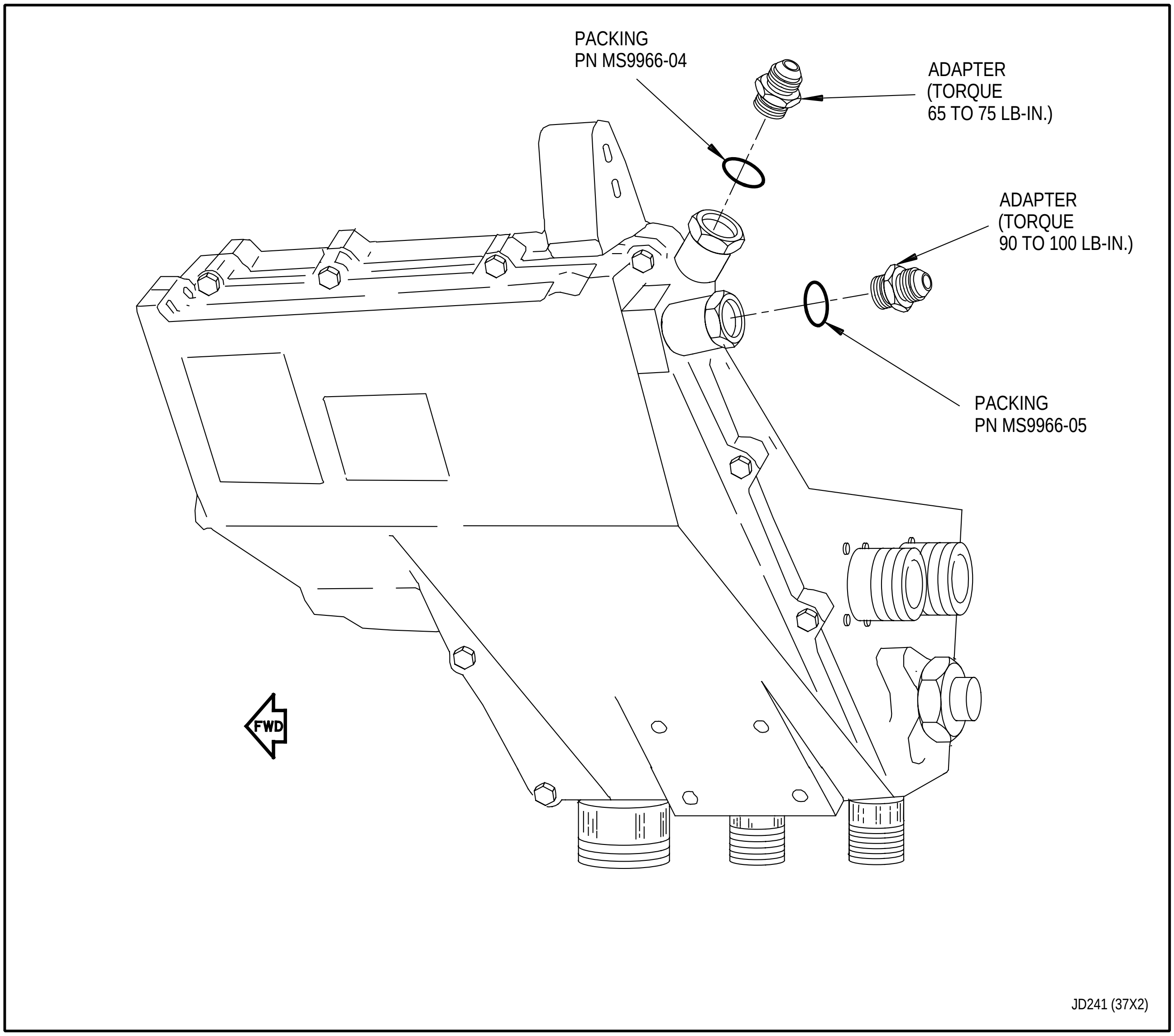


Figure 4. Engine Diagnostic Unit - Installation of Attaching Parts

7. ENGINE DIAGNOSTIC UNIT - INSTALLATION. (See Figure 5.)

a. Apply a light coat of PWA 550 antigalling compound to threads of all bolts and screws. Remove excess.

b. Position EDU mounting lugs to brackets. (See figure 5.)

c. Install bolts to secure EDU to forward upper and lower brackets. Do not torque bolts at this time.

d. Install bolts to secure EDU to rear upper and lower brackets. Torque all bolts 62 to 72 pound-inches.

e. Lubricate threads of fuel inlet and outlet adapters with MIL-L-7808 oil.

CAUTION

Exercise care when installing tube, hose and manifold assemblies to prevent scratches, nicks and dents. Exerting force or pressure on tube when tightening tube coupling nuts, or fastening bolts and nuts may cause tube to bend or distort.

e. Install fuel coolant inlet and outlet tubes per 2J-F100-53-5, WP 064 00.

g. Install electrical connector J1 bracket as follows:

(1) Apply a light coat of PWA 550 antigalling compound to threads of bolts. Remove excess.

(2) Position connector and electrical connector bracket on EDU.

(3) Secure bracket to EDU with bolts. Torque bolts 18 to 20 pound-inches.

h. Connect electrical connectors P121, P48, P50, P51, and P70 to mating receptacles on EDU as follows:

(1) Align keyways and handtighten connector.

(2) Ensure red line on receptacle is not visible when viewed at right angles.

(3) Tighten connector firmly with soft-jawed pliers.

i. Connect hinged cushioned loop clamp securing red and violet cables at P70 connector.

j. Connect hinged cushioned loop clamp securing violet cable at front lower EDU bracket.

k. If airframe connections will be installed on connectors J144 and J145, remove caps from these connectors and save for future shipping closure use.

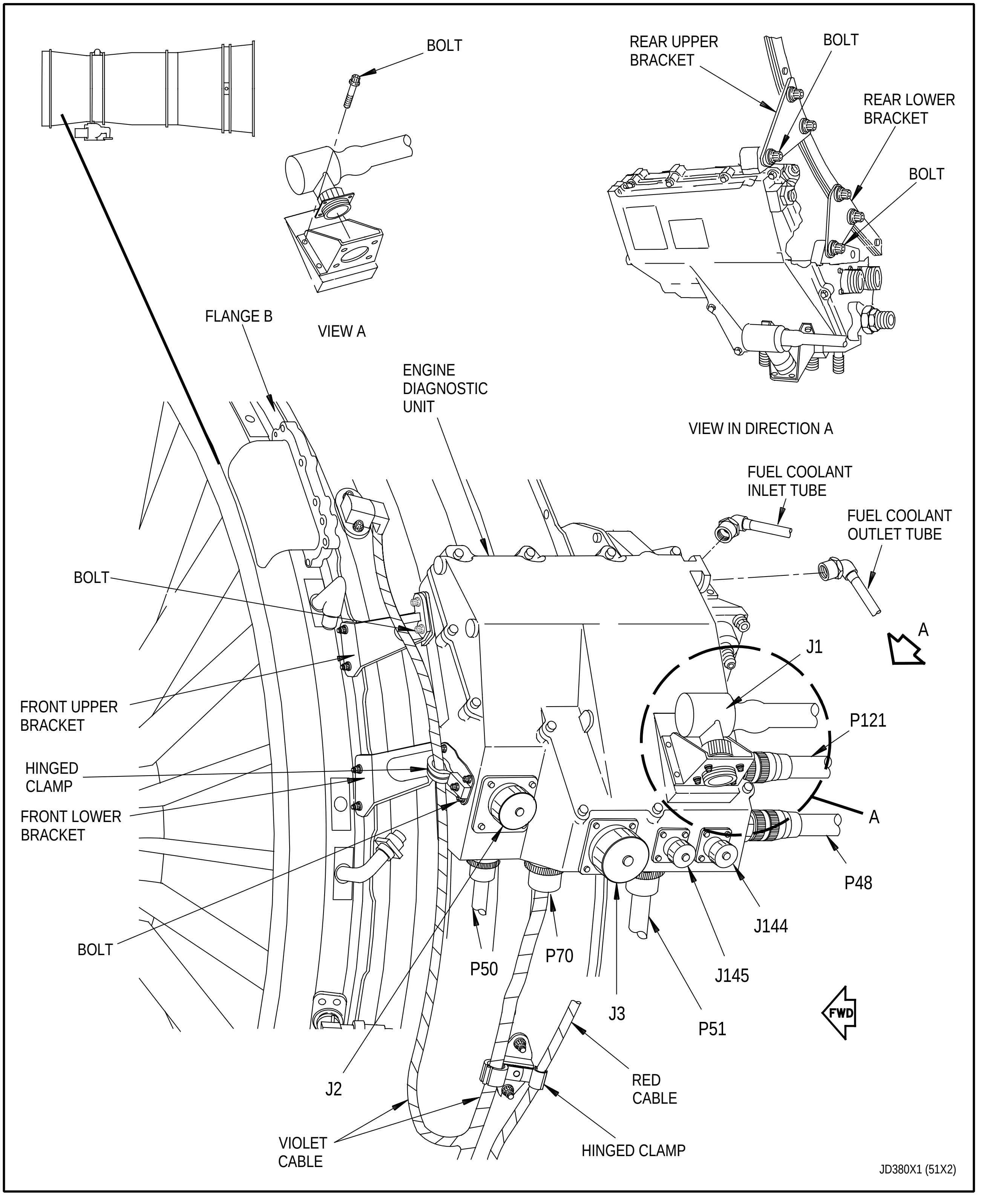


Figure 5. Engine Diagnostic Unit - Installation

8. ENGINE DIAGNOSTIC UNIT, PRESSURE RELIEF VALVE - REMOVAL AND INSTALLATION.

(See figure 6.)

NOTE

Remove presure relief valve only if damaged or if test indicates that valve shall be replaced.

a. Remove pressure relief valve(3) as follows:

(1) Unscrew pressure relief valve(3) from control housing(1).

(2) Remove and discard preformed packing(2).

b. Install pressure relief valve(3) as follows:

(1) Install and torque pressure relief valve(3) within 5 minutes after applying primer as described in the following steps.

(2) Thoroughly clean screw threads on pressure relief valve(3) and remove any surface contamination.

(3) Degrease and clean surface of screw threads on pressure relief valve(3), and screw threads in opening of control housing using isopropyl alcohol. Allow to air dry.

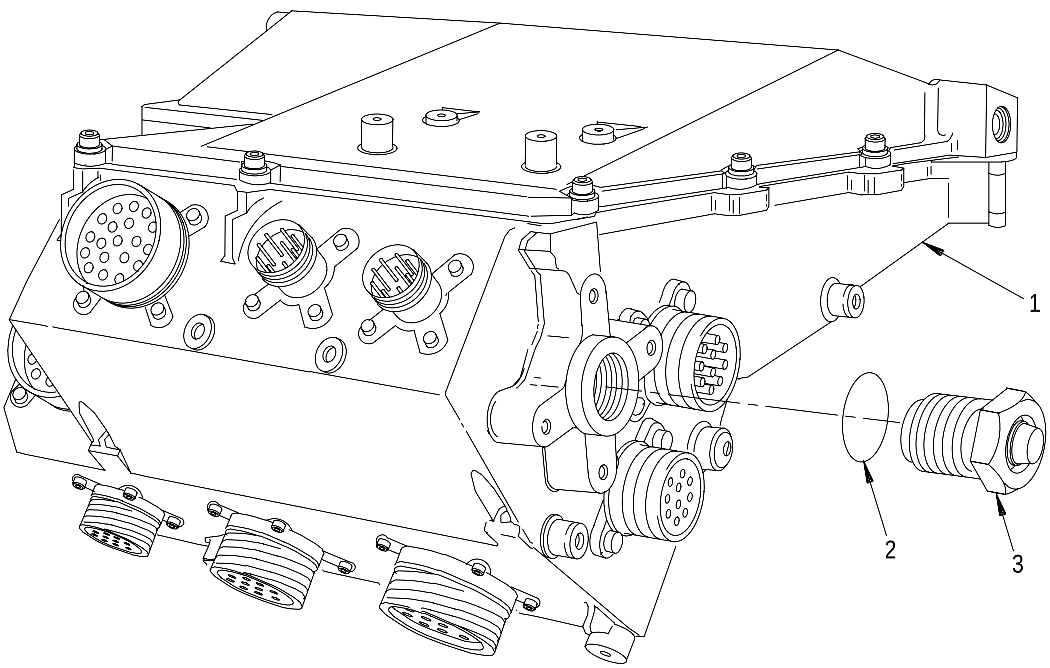
(4) Apply a thin even coat of silicone grease (DC4) on preformed packing(2). Install preformed packing on pressure relief valve(3).

(5) Apply a thin even coat of primer compound (Locquic Primer T) on screw threads of pressure relief valve(3).

(6) Apply a thin even coat of sealing compound (Loctite, Grade EV) on screw threads of pressure relief valve(3).

(7) Install pressure relief valve(3) in opening of control housing. Torque pressure relief valve(3) 30 to 35 pound-inches.

(8) Wipe excess sealing compound with a clean dry cloth.



1. Engine Diagnostic Unit
2. Packing
3. Pressure relief valve

Figure 6. Engine Diagnostic Unit, Pressure Relief Valve - Removal and Installation

9. ENGINE DIAGNOSTIC UNIT - STORAGE AND SHIPMENT.

CAUTION

The following instructions shall be complied with before shipping EDU to make sure it is not contaminated or damaged.

a. Remove attaching parts and purge EDU. Refer to paragraph 3.

b. Cover all open ports and fittings securely using appropriate closures.

(1) If tethered caps are missing use PN CD18 protective closure for connector J3 and PN WW8 for connectors J144 and J145.

CAUTION

Do not water wash or dip accessory in solvent as this procedure can cause severe internal corrosion damage.

c. If exterior of EDU requires cleaning, wipe with clean cloth moistened with P-D-680, Type II petroleum solvent and dry with clean, dry, lint-free cloth.

d. Cover EDU with waterproof material such as polyethylene film and seal with moisture proof tape.

e. Pack EDU in shipping container, ensuring unit is securely mounted; if no mounting provisions are available, ensure unit is thoroughly cushioned with shock absorbent packing material.

WORK PACKAGE

TECHNICAL PROCEDURES

IGNITER - SPARK, GAS TURBINE ENGINE, MAIN

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 26

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	27	7 - 11	0	14A - 14E Added	27
2	7	12	27	14F Blank Added	27
3 - 4	27	13	18	15 - 16	27
5	0	14	27	17 - 18	0
6	22			19 - 20	7

REFERENCE MATERIAL REQUIRED

Title	Number
Engine Test	T.O. 2J-F100-11-2
Ignition System Anomalies	WP 518 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Alcohol, isopropyl	TT-I-735
Brush, solder	-
Brush, wire	-
Cloth, lint-free	-
Compound, antigalling (PWA 550)	Hi-T-650 or Lubri-Bond HT
Compound, antiseize (PWA 36053-3)	Antiseize 771
Compound, silicone dielectric	MIL-S-8660C
Cotton swab	-
Oil, lubricating	MIL-L-7808
Petrolatum	VV-P-236

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Packing, preformed	MS9386-121	2
Packing, preformed	MS9386-133	2

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
2	GAS TURBINE ENGINE MAIN SPARK IGNITER - REMOVAL	
	LEAD, SHORTING -	PWA 52176 OR
	IGNITION TEST SET -	PN 137375
5	GAS TURBINE ENGINE MAIN SPARK IGNITER - IMMERSION CHECK USING PWA 57116 GAGE	
	GAGE, MAIN SPARK IGNITER MOUNTING DISTANCE - - - - - -	PWA 57116
5A	GAS TURBINE ENGINE MAIN SPARK IGNITER - IMMERSION CHECK USING PWA 56694 GAGE	
	GAGE, MAIN SPARK IGNITER MOUNTING DISTANCE - - - - - -	PWA 56694
6	RING SPACER - REPLACEMENT	
	WRENCH, DIFFUSER CASE IGNITER INSERT - - - - - - - - - -	PWA 51704

ILLUSTRATED SUPPORT EQUIPMENT

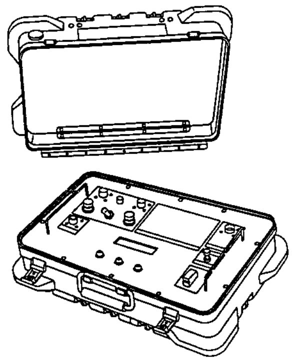

PN 137375 –C

Figure T1. PN 137375 IGNITION TEST SET

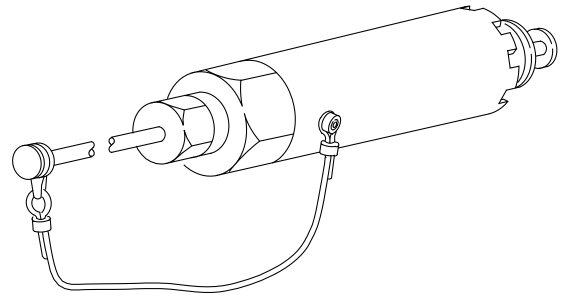

PWA 51704 –C

Figure T2. PWA 51704 WRENCH

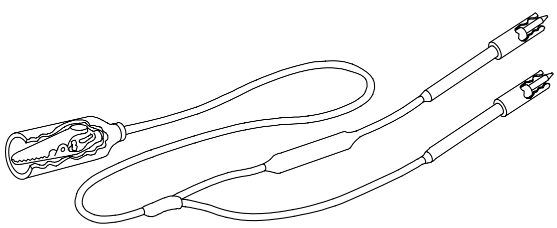

PWA 52176 –C

Figure T3. PWA 52176 LEAD

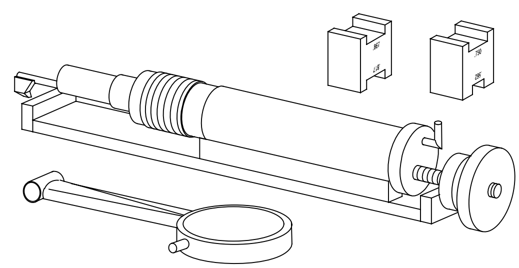

PWA 56694 –C

Figure T4. PWA 56694 GAGE

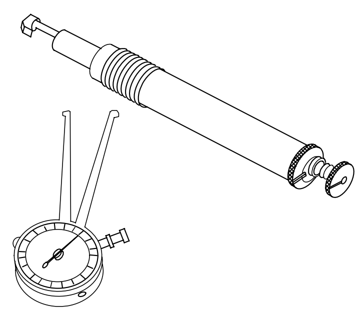

PWA 57116 –C

Figure T5. PWA 57116 GAGE

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures on the gas turbine engine main spark igniters:

- Removal
- Cleaning
- Inspection
- Immersion check
- Ring spacer - Replacement
- Installation
- Follow-on maintenance

2. GAS TURBINE ENGINE MAIN SPARK IGNITER - REMOVAL.

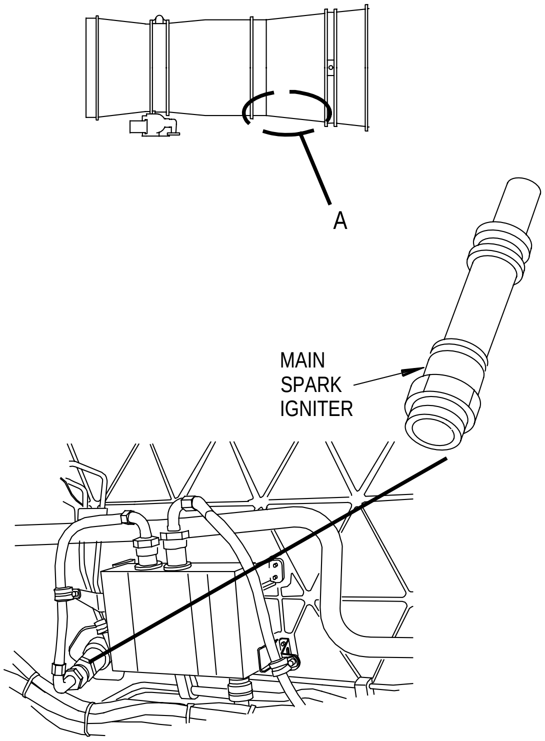
(See Figures 1 and 2.)

NOTE

If PN 137375 ignition test set is used procedures are performed using operation and maintenance manual accompanying ignition test set

a. Use care when disconnecting or handling exciter to igniter electrical power cable. Bending to a less than 5 inch inside radius can cause conduit to break, with subsequent electrical circuit failure.

b. Remove left side main spark igniter. (See figure 1.) Remove right side. (See figure 2.)

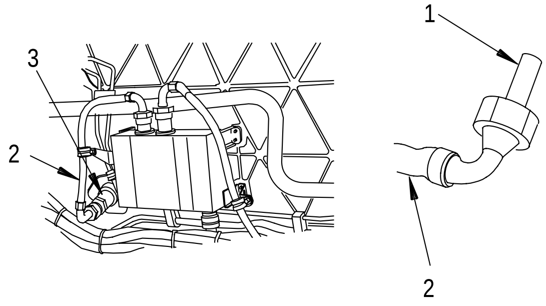


VIEW A

WARNING

DO NOT LET CABLE TERMINAL (1) TOUCH ANY PART OF ENGINE. IT COULD PRODUCE A HIGH VOLTAGE SPARK.

a. DISCONNECT ELECTRICAL CABLE (2) FROM SPARK IGNITER (3).



b. CONNECT ALLIGATOR GROUND CLIP (4) OF PWA 52176 SHORTING LEAD TO ENGINE GROUND (AN UNPAINTED BOLT HEAD) OR EXCITER BRACKET.

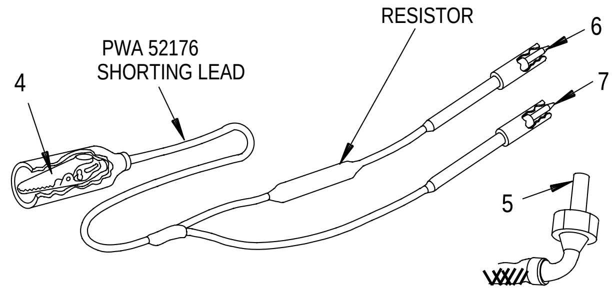
WARNING

TO AVOID SPARK, LEAD (6, LEAD WITH RESISTOR) SHALL BE HELD FIRMLY TO CABLE TERMINAL (5).

c. TOUCH LEAD (6, LEAD WITH RESISTOR) TO TERMINAL (5) FOR 1 MINUTE. REMOVE LEAD (6).

d. TOUCH LEAD (7) TO TERMINAL (5) FOR 1 MINUTE. REMOVE LEAD (7).

e. REMOVE LEAD (4) FROM ENGINE GROUND.



f. LOOSEN BUT DO NOT REMOVE NUTS (8).

CAUTION

USE A DEEP SOCKET WRENCH TO REMOVE IGNITER (9). DO NOT USE OPEN END WRENCH, BOX WRENCH, OR EQUIVALENT.

g. REMOVE IGNITER (9).

h. REMOVE AND DISCARD PACKING (10).

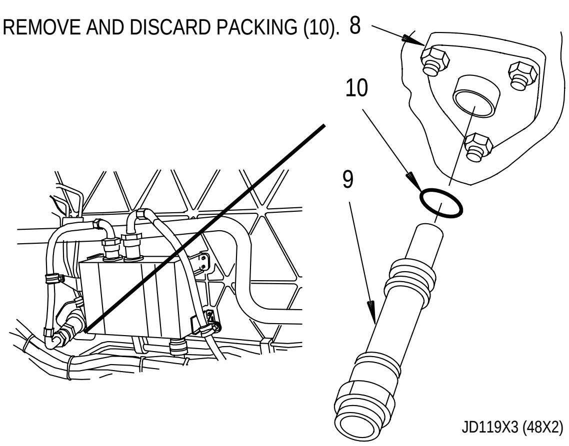
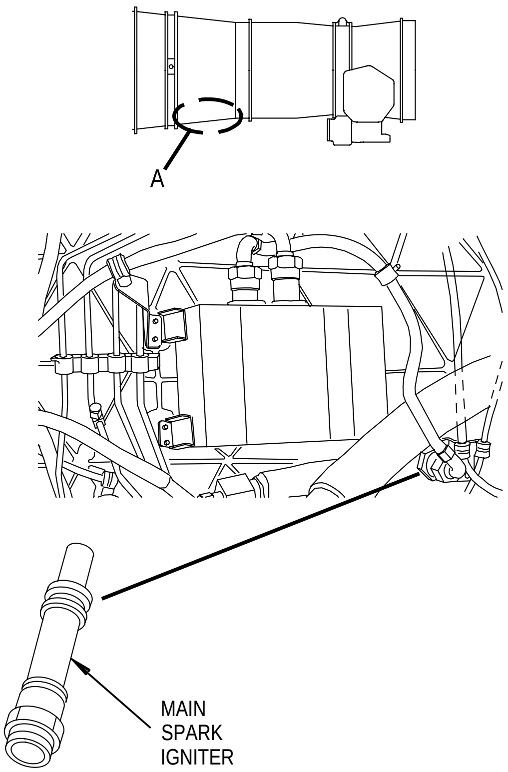


Figure 1. Gas Turbine Engine Main Spark Igniters (Engine Left Side) - Removal



VIEW A

b. CONNECT ALLIGATOR GROUND CLIP (4) OF PWA 52176 SHORTING LEAD TO ENGINE GROUND (AN UNPAINTED BOLT HEAD) OR EXCITER BRACKET.

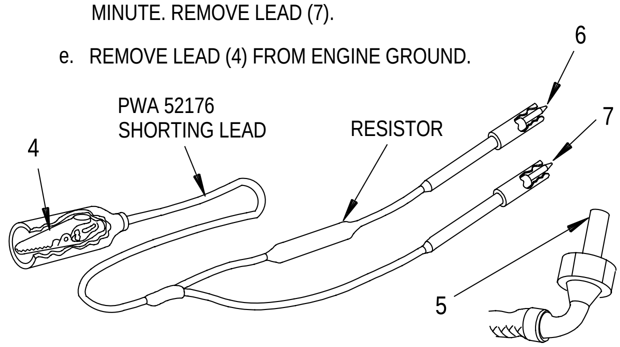
WARNING

TO AVOID SPARK, LEAD (6, LEAD WITH RESISTOR) SHALL BE HELD FIRMLY TO CABLE TERMINAL (5).

c. TOUCH LEAD (6, LEAD WITH RESISTOR) TO TERMINAL (5) FOR 1 MINUTE. REMOVE LEAD (6).

d. TOUCH LEAD (7) TO TERMINAL (5) FOR 1 MINUTE. REMOVE LEAD (7).

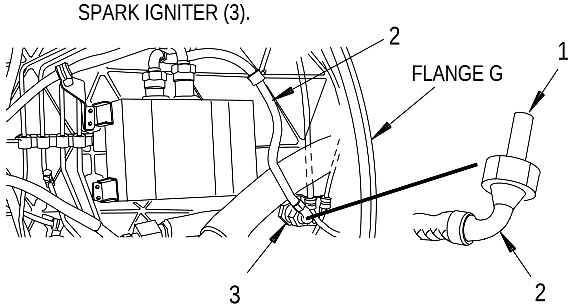
e. REMOVE LEAD (4) FROM ENGINE GROUND.



WARNING

DO NOT LET CABLE TERMINAL (1) TOUCH ANY PART OF ENGINE. IT COULD PRODUCE A HIGH VOLTAGE SPARK.

a. DISCONNECT ELECTRICAL CABLE (2) FROM SPARK IGNITER (3).



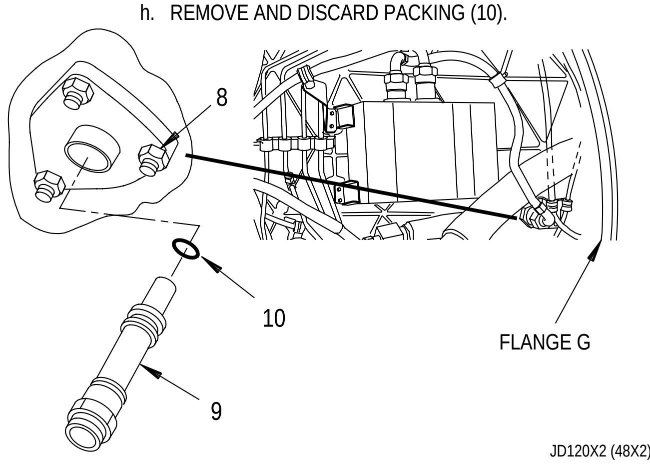
f. LOOSEN BUT DO NOT REMOVE NUTS (8).

CAUTION

USE A DEEP SOCKET WRENCH TO REMOVE IGNITER (9). DO NOT USE OPEN END WRENCH, BOX WRENCH, OR EQUIVALENT.

g. REMOVE IGNITER (9).

h. REMOVE AND DISCARD PACKING (10).



JD120X2 (48X2)

Figure 2. Gas Turbine Engine Main Spark Igniters (Engine Right Side) - Removal

3. GAS TURBINE ENGINE MAIN SPARK IGNITER - CLEANING.

(See Figure 3.)

CAUTION

Do not use abrasive cleaner to clean igniters.

a. Clean exterior of igniter with clean cloth moistened TT-I-735 isopropyl alcohol. Dry with clean, dry lint-free cloth.

b. Clean outer shell with wire brush.

c. Clean exposed surfaces of ceramic insert with soft cloth moistened with isopropyl alcohol.

d. Clean igniter terminal well using cotton swab moistened with isopropyl alcohol.

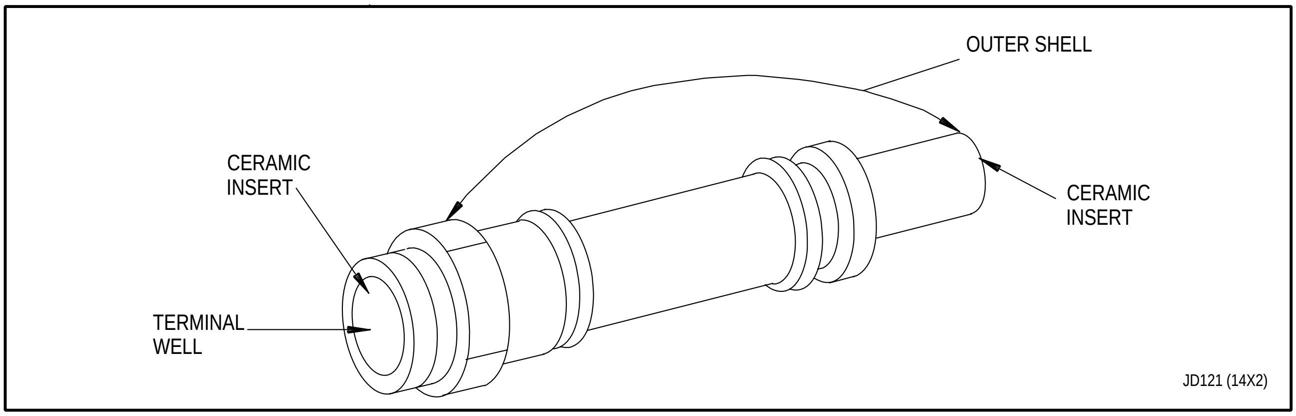


Figure 3. Gas Turbine Engine Main Spark Igniter - Cleaning

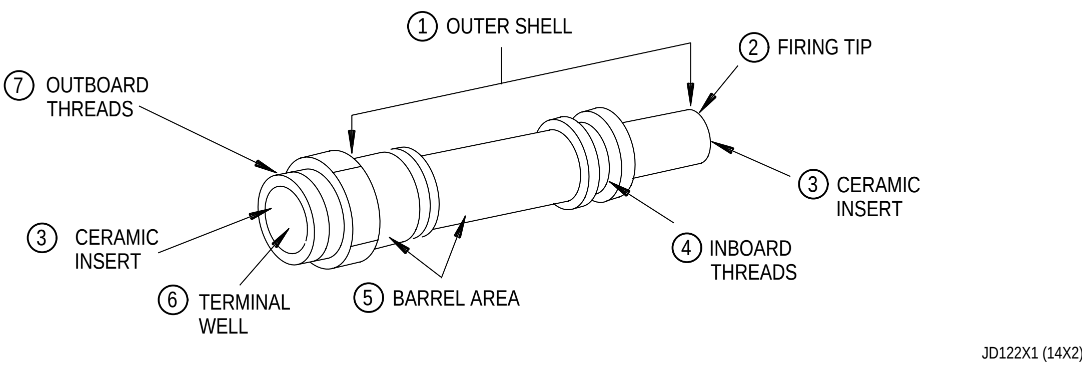
4. GAS TURBINE ENGINE MAIN SPARK IGNITER - INSPECTION.
(See Figure 4.)

a. Examine gas turbine engine main spark igniter for internal breakage by shaking igniter and listening for rattle. A faint rattle may be heard due to high tolerance fit of center electrode to ceramic insulation. This can be ignored. A definite rattling sound is cause for rejection; replace spark igniter. Questionable igniters should be checked for internal arcing. Refer to T.O. 2J-F100-11-2, WP 518 00.

NOTE

Some arcing is normal between lead and terminal contacts. This is acceptable provided that contacts have not been excessively eroded.

b. Inspect igniter. (See figure 4.)



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Outer shell -			
Wear	0.020 inch depth at any location	Not reparable	Replace igniter.
2. Firing tip -			
Centerhole	0.210 inch diameter maximum	Not reparable	Replace igniter.

Figure 4. Gas Turbine Engine Main Spark Igniter - Inspection

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
3. Ceramic insert -			
Carbon tracking	Not serviceable	Not reparable	Replace igniter.
Cracks, missing pieces	Not serviceable	Not reparable	Replace igniter.
4. Inboard threads -			
Missing	Up to 1/2 of approach threads	Not reparable	Replace igniter.
Silver plating	Serviceable if loss of silver plating is less than 10%	See corrective action.	If loss of silver plating is more than 10%, lubricate inboard threads with PWA 36053-3 antiseize compound before installation.
5. Barrel area-			
Rub wear	Barrel area is 1.230 inch diameter minimum	Not reparable	Replace igniter.
6. Terminal well -			
Arcing, carbon tracking	Not serviceable	Not reparable	Replace igniter.
Dirt or contaminants	Not serviceable	Any amount	Clean. Refer to paragraph 3.
7. Outboard threads-			
Missing	Up to 1/2 of approach threads	Not reparable	Replace igniter.

5. GAS TURBINE ENGINE MAIN SPARK IGNITER - IMMERSION CHECK USING PWA 57116 GAGE.
(See Figure 5.)

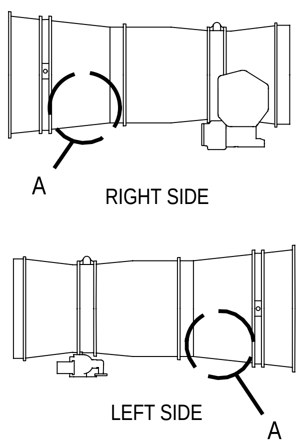
NOTE

- This check is required only when igniter depth is uncertain. A warped combustion chamber can cause improper installation of igniters, resulting in uncertain depth.
- A classified ring spacer installed under the insert in the diffuser case igniter boss adjusts the immersion depth of the igniter to its proper level.

a. Using PWA 57116 gage, measure for proper immersion depth of gas turbine engine main spark igniter and required ring spacer. (See figure 5.)

b. If Dimension A obtained in figure 5 is 0.664 to0.694 inch for both sides of engine, install igniter. Refer to paragraph 7. If Dimension A is not within these limits, replace applicable ring spacer. Refer to paragraph 6.

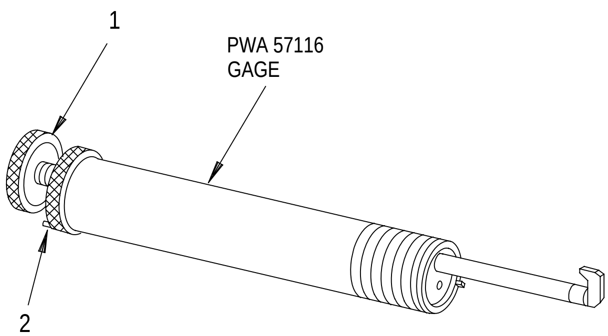
GAS TURBINE ENGINE MAIN SPARK IGNITER – IMMERSION CHECK USING PWA 57116 GAGE

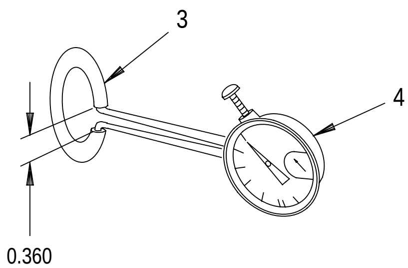


a. HOLD PIN (2) OF PWA 57116 GAGE.

b. TURN KNOB (1) TO ALIGN ARROW ON KNOB (1) WITH PIN (2).

c. PLACE INTERNAL DIAL CALIPER DETAIL (4) IN A MICROMETER, 0.360 GAGE OR EQUIVALENT (3). SET DIAL (4) POINTER TO ZERO.



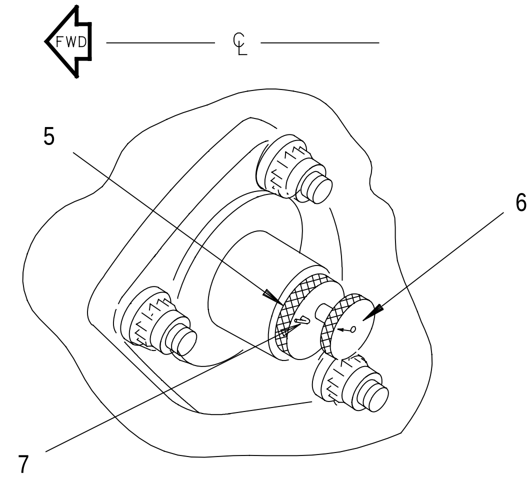


NOTE

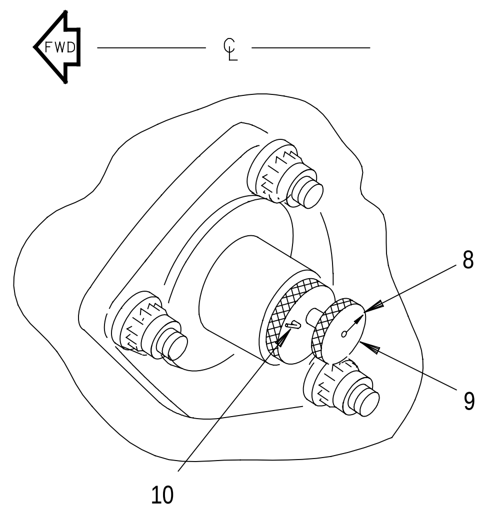
ALL DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED

d. INSERT GAGE (5) IN FAN DUCT AND THREAD TO SEAT IN DIFFUSER CASE.

e. ENSURE PIN (7) POINTS FORWARD AND IS ALIGNED WITH ARROW(6) WHEN GAGE (5) IS SEATED.



f. HOLD PIN (10). PUSH KNOB (9) INWARD AND ROTATE UNTIL ARROW (8) POINTS TO REAR OF ENGINE. RELEASE KNOB (9) SLOWLY.



76754 (48X2)

Figure 5. Gas Turbine Engine Main Spark Igniter - Immersion Check Using PWA 57116 Gage (Sheet 1 of 2)

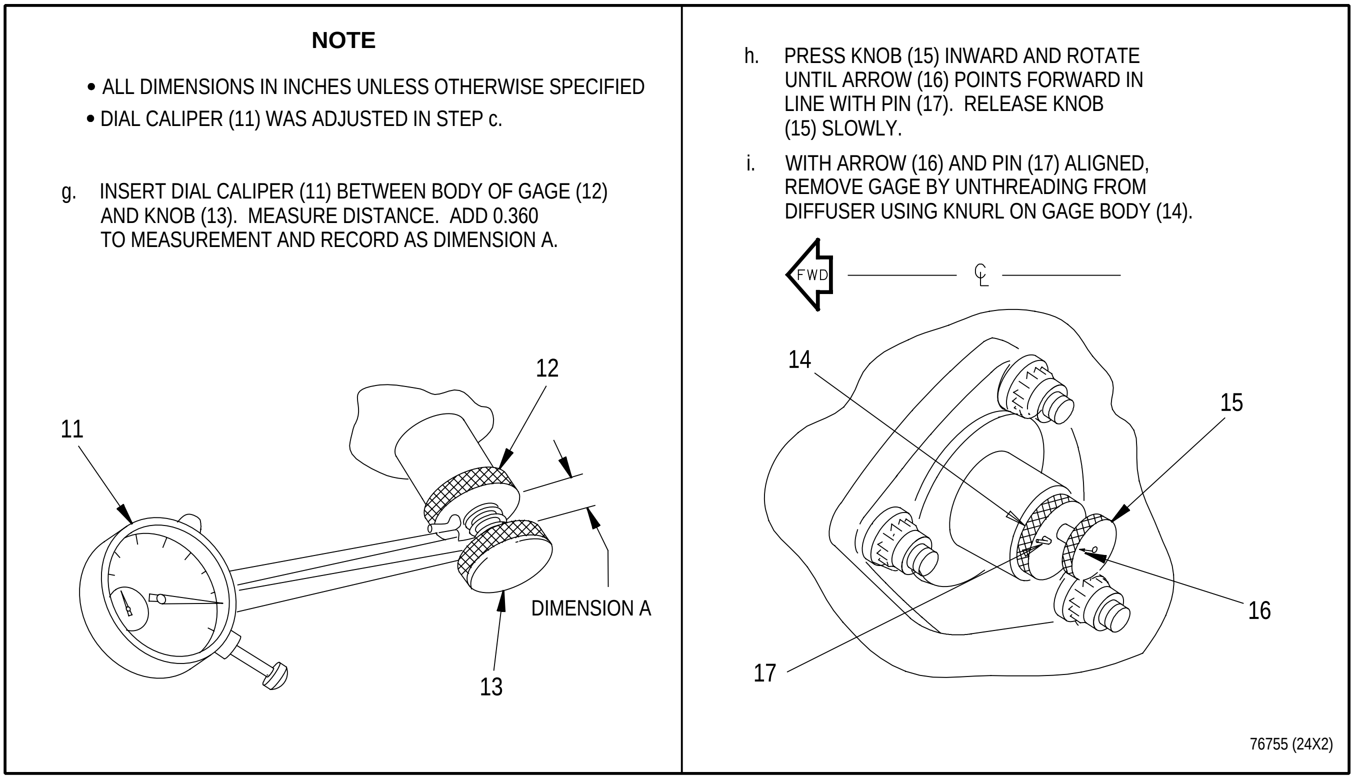


Figure 5. Gas Turbine Engine Main Spark Igniter - Immersion Check Using PWA 57116 Gage (Sheet 2 of 2)

5A. GAS TURBINE ENGINE MAIN SPARK IGNITER - IMMERSION CHECK USING PWA 56694 GAGE
(See Figures 5A and 5B and Table 1.)

a. Prepare PWA 56694 gage for use as follows:

(1) Place set master assembly(7, figure 5A) on suitable flat surface.

(2) Place PWA 56694 gage on master ensuring locator(3) rests in V with inside edge of locator knurled area(4) snug against edge of V. Indicator rod assembly(8) and inner knob(5) should be against finished surfaces 10.000 inches apart as shown. If not, return PWA 56694 gage for calibration.

NOTE

There are two set blocks marked with dimensions for engine configuration and igniter location.

(3) Select correct set block(2), for location and engine application being measured. Insert internal dial caliper(1) feet in set block and adjust dial indicator to zero.

(4) Verify correct reading on dial indicator as follows:

(a) Select another set block(2) and subtract block dimensions, noting difference.

(b) Place internal dial caliper(1) in second set block(2) and verify dial indicator reading with calculated difference.

b. Install PWA 56694 gage in igniter plug insert(8, figure 5B) as follows:

CAUTION

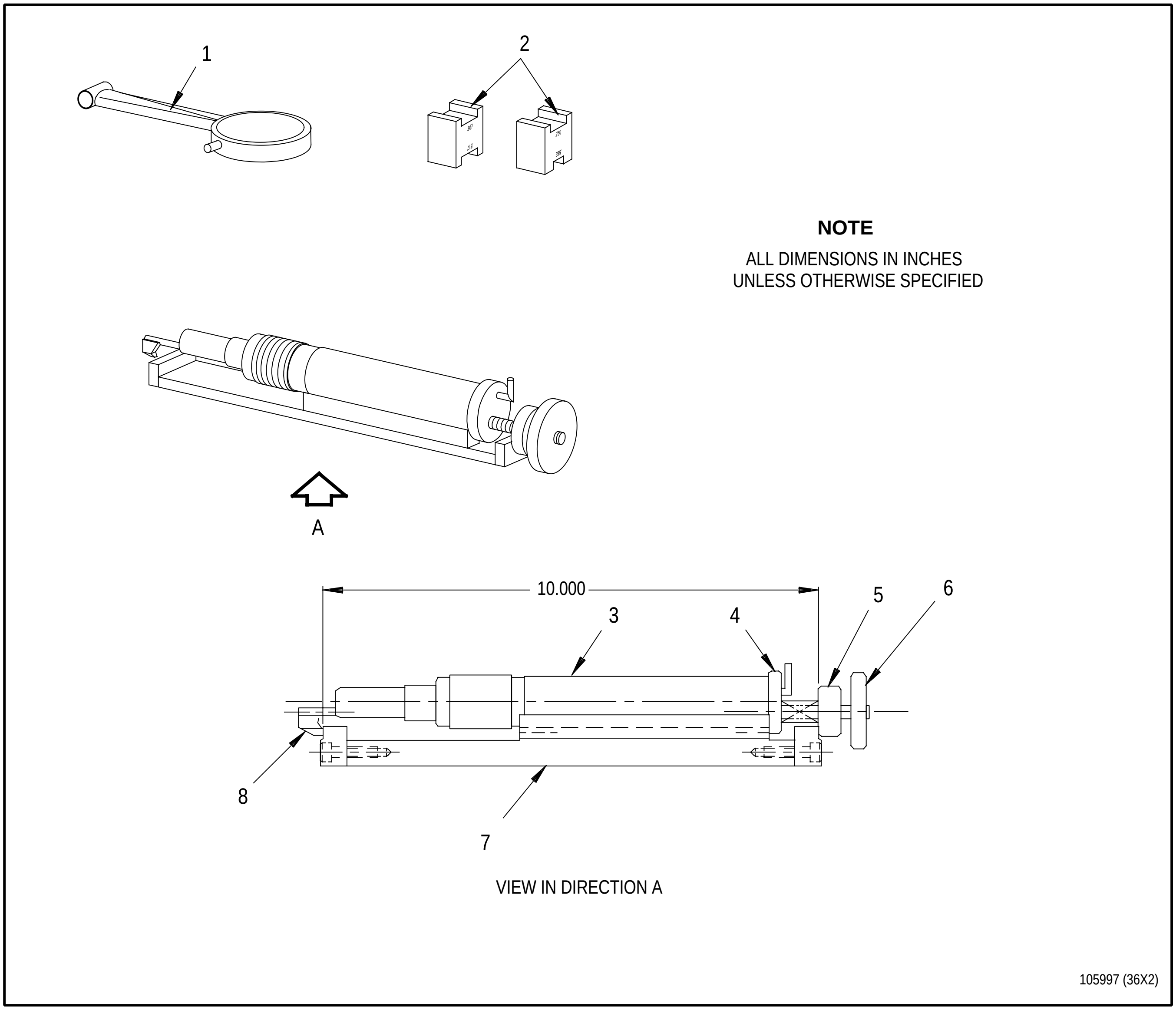
Failure to align directional pin and arrow on outer knob prior to gage installation may damage tool.

NOTE

- Warpage of combustion chamber may cause improper igniter penetration into combustion chamber. A check for proper igniter penetration into combustion chamber is performed before igniter installation.
- A classified ring spacer installed under insert in diffuser case igniter boss adjusts immersion depth of the igniter to its proper level.

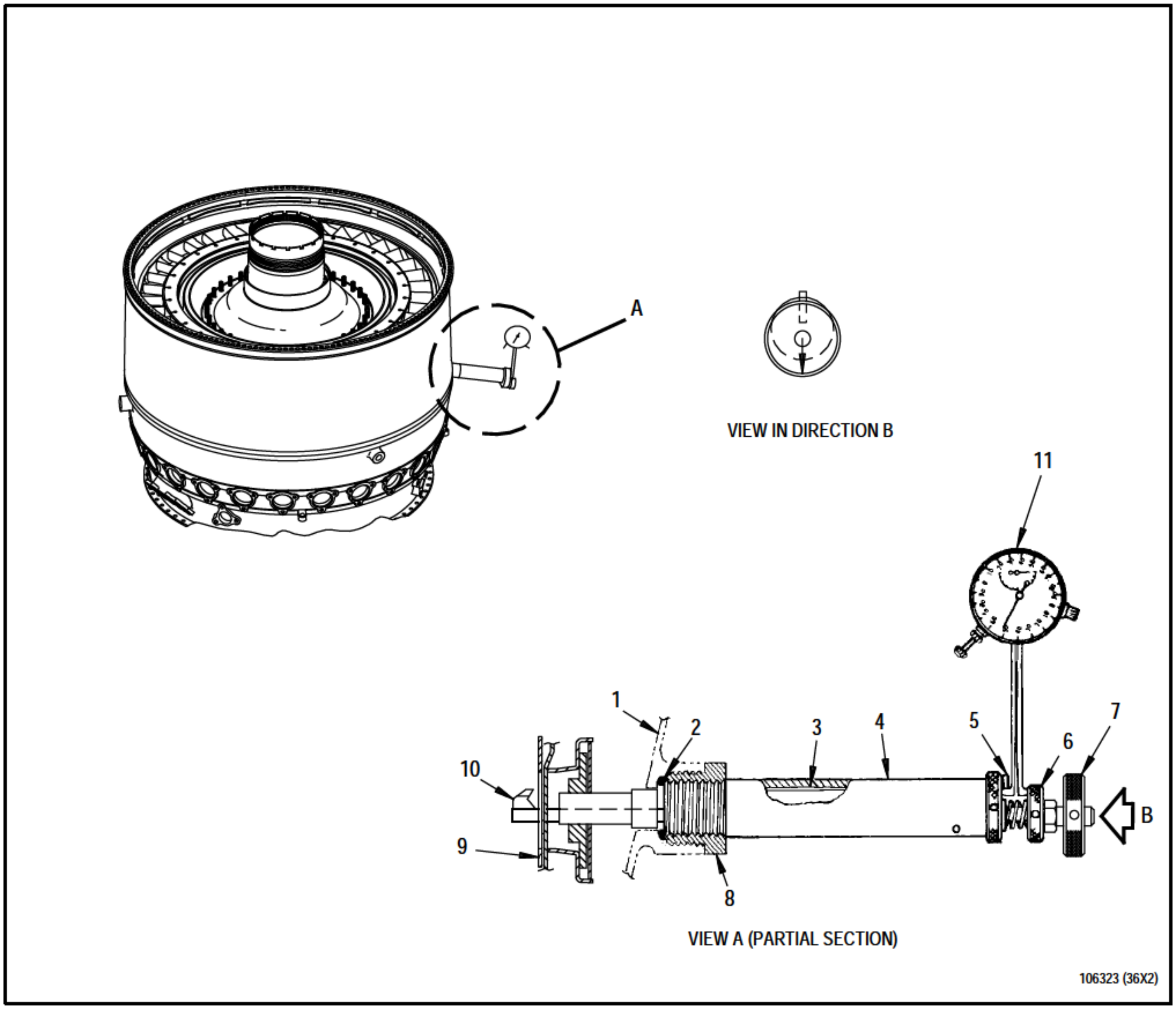
(1) Hold directional pin(5) on probe(3) and turn outer knob(7) to align arrow on knob with directional pin(5). Indicator rod assembly (10) will be positioned in slot and contained within probe(3).

(2) Thread PWA 56694 gage into igniter plug insert(8) until it bottoms lightly.



1. Internal dial caliper
2. Set blocks
3. Locator
4. Locator knurled area
5. Inner knob
6. Outer knob
7. Set master assembly
8. Indicator rod assembly

Figure 5A. PWA 56694 Gage - Preparation For Use



1. Diffuser case
2. Ring spacer
3. Probe
4. Outer locator
5. Directional pin
6. Inner knob
7. Outer knob
8. Igniter plug insert
9. Combustion chamber liner
10. Indicator rod assembly
11. Internal dial caliper

Figure 5B. Gas Turbine Engine Main Spark Igniter - Immersion Check Using PWA 56694 Gage

CAUTION

Pushing inward on outer knob when turning directional pin may cause tool damage.

c. Use directional pin(5) to turn probe(3) until arrow on outer knob(7) is aligned with centerline of engine and pointing rearward. Hold this position, confirm PWA 56694 gage is handtight into igniter plug insert.

d. Hold directional pin(5) to keep probe(3) from turning. Push outer knob(7) in, rotating it until arrow is pointing forward.

e. Slowly release pressure on outer knob(7) until indicator rod assembly insert(10) rests on combustion chamber wall.

f. Insert internal dial caliper(11) so feet fit between inner knob(6) and end of outer locator(4). Record dial indicator difference from zero initial setting in thousandths for calculation purposes only.

g. Compare recorded indicator difference with table 1 tolerance value for appropriate engine configuration.

(1) If recorded difference is within tolerance value limits, no action is required. Remove gage and install igniter per paragraph 7.

(2) If recorded difference is smaller than tolerance value, thinner ring spacer(2) is required. Remove gage and replace applicable ring spacer per paragraph 6.

(3) If recorded difference is larger than tolerance value, thicker ring spacer(2) is required. Remove gage and replace applicable ring spacer per paragraph 6.

h. Remove PWA 56694 gage as follows (see figure 5B):

CAUTION

Failure to align directional pin and arrow on outer knob prior to gage removal may cause damage to tool and combustion chamber.

(1) Hold directional pin(5) on probe(3). Push in and turn outer knob(7) to align arrow on knob with directional pin(5) (rearward). Release pressure on outer knob(7). Indicator rod assembly insert(10) will be positioned in slot and contained within probe(3).

(2) Unscrew PWA 56694 gage from igniter plug insert(8) and carefully remove.

Table 1. Nominal Dimensions For Selecting Igniter Plug Spacer Rings

Gage	Both Sides (inch)
PWA 57116	0.694
PWA 56694	0.867 +/- 0.015

6. RING SPACER - REPLACEMENT.
(See Figures 6 through 8, table 1 and Table 2.)

NOTE

Requirement to replace ring spacer was determined in paragraph 5 or 5A.

a. Remove ring spacer from right or left side of engine as follows: (See figure 6.)

(1) Remove nuts securing retaining plate and sleeve seat to boss on rear fan duct. Remove retaining plate and sleeve seat. Discard packing.

(2) Insert PWA 51704 wrench through fan duct and thread inner detail into insert in diffuser case.

(3) Push rod detail inboard.

(4) Press outer detail inboard and rotate to seat its lugs into slots in insert.

NOTE

Ring spacer will drop onto rod detail when insert is threaded out of diffuser case. Spacer and insert will be removed with wrench.

(5) Unthread insert using wrenching flats on outer detail and remove wrench, ring spacer and insert.

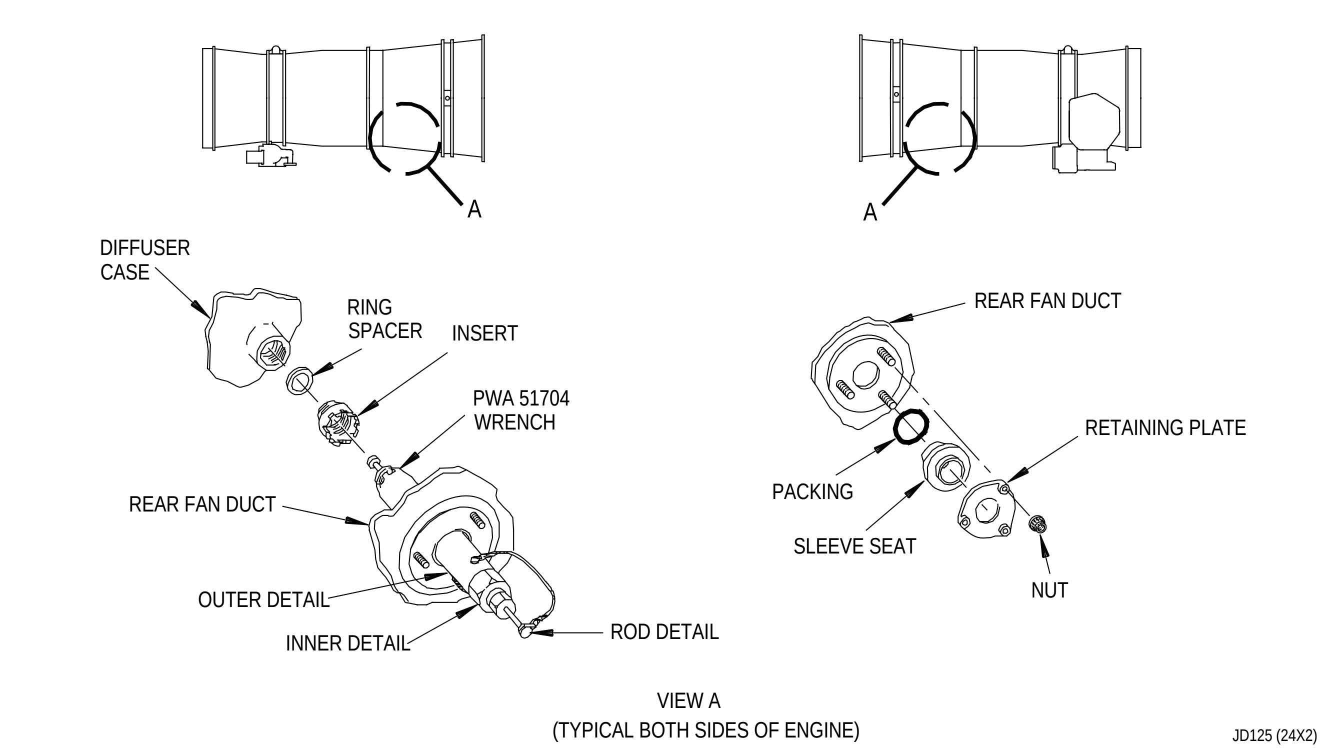


Figure 6. Ring Spacer - Removal

NOTE

Dimensions may have been measured using either PWA 57116 or 56694 gage. Proceed to applicable step b or b1.

b. Using Dimension A obtained with PWA 57116 gage in paragraph 5, determine replacement ring spacer class as follows:

(1) If no spacer was installed under insert, subtract 0.694 inch from Dimension A and choose class spacer equal to that value. (See table 2.)

(2) Measure thickness of removed ring spacer.

NOTE

If required thinner class ring spacer is not available, thicker spacer may be lapped or ground to required thickness. (See figure 7.)

(3) If Dimension A was more than 0.694 inch, add excess to thickness of removed spacer and choose thicker class spacer equal to that value. (See table 2.)

(4) If Dimension A was less than 0.664 inch, subtract difference from thickness of removed spacer and choose thinner class spacer equal to that value. (See table 2.)

b1. Using recorded dial indicator difference reading obtained with PWA 56694 gage in paragraph 5A, determine replacement ring spacer class as follows:

NOTE

Nominal dimensions for selecting igniter plug spacer rings are provided in table 1.

(1) Measure thickness of removed ring spacer.

(2) If dial indicator difference reading was more than table 1 tolerance value, thicker class spacer is required. Add difference to thickness of removed spacer. Select thicker class spacer from table 2 matching result of addition.

NOTE

If required thinner class ring spacer is not available, thicker spacer may be lapped or ground to required thickness per requirements of figure 7.

(3) If dial indicator difference reading was less than table 1 tolerance value, thinner class spacer is required. Subtract difference from thickness of removed spacer. Select thinner class spacer from table 2 matching result of subtraction.

Table 2. Ring Spacer Sizes

Class	Thickness
A	0.005 to 0.015 inch
B	0.015 to 0.025 inch
C	0.025 to 0.045 inch
D	0.045 to 0.065 inch
E	0.065 to 0.085 inch
F	0.085 to 0.105 inch
G	0.105 to 0.125 inch
H	0.125 to 0.145 inch
J	0.145 to 0.165 inch
K	0.165 to 0.185 inch
L	0.185 to 0.205 inch
M	0.205 to 0.225 inch
N	0.225 to 0.245 inch
P	0.245 to 0.265 inch

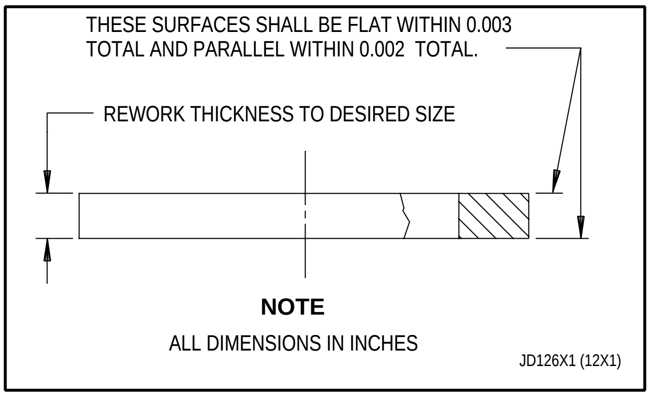


Figure 7. Ring Spacer

c. Install ring spacer to right or left side of engine as follows: (See figure 8.)

(1) Thread insert onto inner detail of PWA 51704 wrench. Slide outer detail down so that lugs on wrench engage slots in insert.

(2) Place ring spacer on insert. Use petrolatum VV-P-236 to hold spacer to insert.

(3) Push rod detail into wrench to catch ring spacer if it comes loose from insert.

(4) Install wrench through fan duct and thread insert into diffuser case. Torque insert 1200 to 1400 pound-inches using wrenching flats on outer detail.

(5) Unthread inner detail from insert and remove wrench.

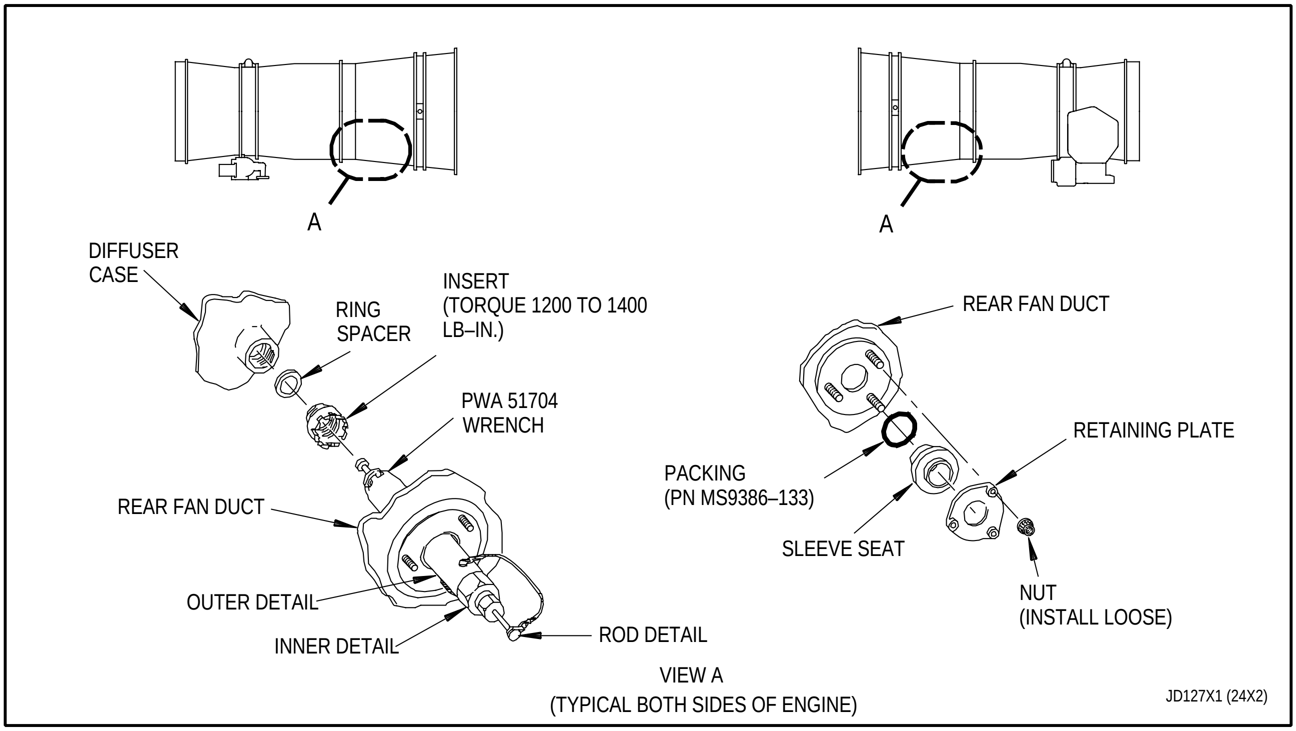


Figure 8. Ring Spacer - Installation

(6) Install lubricated packing in ring groove in igniter mount pad on fan duct.

(7) Apply PWA 550 antigalling compound to threads of studs on igniter mounting pad. Remove excess.

(8) Install sleeve seat and retaining plate, secure with three loosely installed nuts.

7. GAS TURBINE ENGINE MAIN SPARK IGNITER - INSTALLATION.

(See Figures 9 and 10.)

a. Install spark igniters. (See figures 9 and 10.)

a. MAKE SURE NUTS (1) ARE LOOSE.

b. LUBRICATE PN MS9386–121 PACKING (2) WITH V V–P–236 PETROLATUM AND INSTALL ON MAIN SPARK IGNITER (3).

WARNING

PWA 36053–3 ANTISEIZE COMPOUND CONTAINS NICKEL WHICH . IS A CARCINOGEN WEAR PROTECTIVE GLOVES WHEN HANDLING THIS ANTISEIZE COMPOUND DO NOT CONTAMINATE FOOD OR SMOKING PRODUCTS WITH THE ANTISEIZE COMPOUND.

CAUTION

- USE DEEP SOCKET WRENCH TO TIGHTEN AND TORQUE IGNITER. DO NOT USE OPEN END WRENCH, BOX WRENCH OR EQUIVALENT TO PREVENT DAMAGE.
- DO NOT USE SILICON DIELETRIC COMPOUND ON ANY OIL SYSTEM HARDWARE. THIS COMPOUND WILL CAUSE OIL FOAMING.

c. LUBRICATE INBOARD THREADS WITH PWA 36053–3 ANTISEIZE COMPOUND IF SILVERPLATE LOSS ON THREADS EXCEEDS 10%

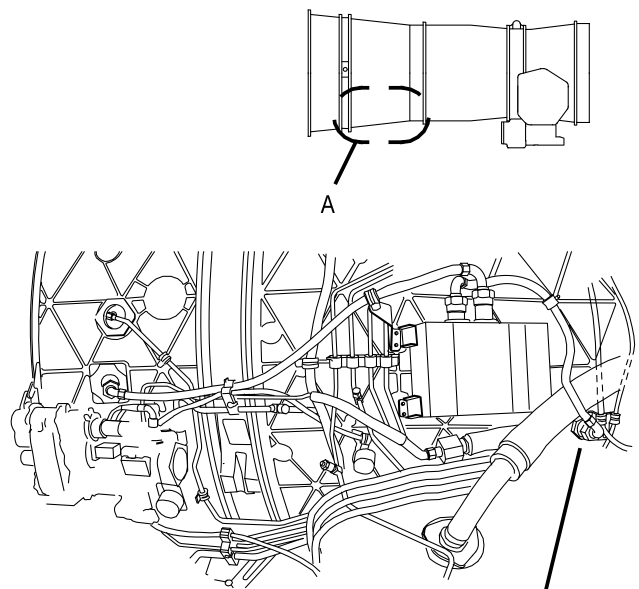
d. INSTALL IGNITER (3) AND TORQUE 300 TO 360 LB–IN.

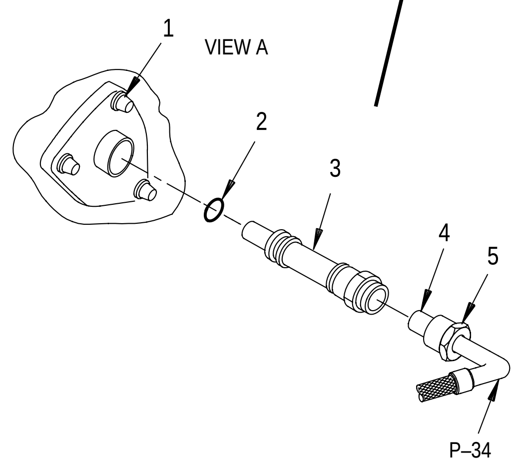
e. TORQUE NUTS (1) 27 TO 30 LB–IN.

f. CLEAN CERAMIC INSULATOR (4), CONTACT BUTTON, RUBBER GROMMET, AND IGNITER WELL OR EXCITER WELL WITH TT–I–735 ISOPROPYL ALCOHOL.

g. APPLY MIL–S–8660C COMPOUND, USING SOLDER BRUSH, APPROXIMATELY 1/32–IN. THICK TO CERAMIC INSULATOR (4) AND RUBBER GROMMET ON BOTH ENDS OF MAIN HIGH TENSION LEAD. WIPE COMPOUND OFF OF END OF HIGH TENSION LEAD CONTACT.

h. CONNECT CABLE CONNECTOR (4 AND 5) TO IGNITER (3). TORQUE CABLE NUT (5) 140 TO 160 LB–IN. UNTIL SHOULDER BOTTOMS ON MATING PART.





32404 (36X2)

Figure 9. Gas Turbine Engine Main Spark Igniters (Engine Right Side) - Installation

a. MAKE SURE NUTS (1) ARE LOOSE.

b. LUBRICATE PN MS9386–121 PACKING (2) WITH V V–P–236 PETROLATUM AND INSTALL ON MAIN SPARK IGNITER (3).

WARNING

PWA 36053–3 ANTISEIZE COMPOUND CONTAINS NICKEL WHICH IS A CARCINOGEN. WEAR PROTECTIVE GLOVES WHEN HANDLING THIS ANTISEIZE COMPOUND. DO NOT CONTAMINATE FOOD OR SMOKING PRODUCTS WITH THE ANTISEIZE COMPOUND.

CAUTION

- USE DEEP SOCKET WRENCH TO TIGHTEN AND TORQUE IGNITER. DO NOT USE OPEN END WRENCH, BOX WRENCH OR EQUIVALENT TO PREVENT DAMAGE.
- DO NOT USE SILICON DIELECTRIC COMPOUND ON ANY OIL SYSTEM HARDWARE. THIS COMPOUND WILL CAUSE OIL FOAMING.

c. LUBRICATE INBOARD THREADS WITH PWA 36053–3 ANTISEIZE COMPOUND IF SILVERPLATE LOSS ON THREADS EXCEEDS 10%.

d. INSTALL IGNITER (3) AND TORQUE 300 TO 360 LB–IN.

e. TORQUE NUTS (1) 27 TO 30 LB–IN.

f. CLEAN CERAMIC INSULATOR (4), CONTACT BUTTON, RUBBER GROMMET, AND IGNITER WELL OR EXCITER WELL WITH TT–I–735 ISOPROPYL ALCOHOL.

g. APPLY MIL–S–8660C COMPOUND, USING SOLDER BRUSH, APPROXIMATELY 1/32–IN. THICK TO CERAMIC INSULATOR (4) AND RUBBER GROMMET ON BOTH ENDS OF MAIN HIGH TENSION LEAD. WIPE COMPOUND OFF OF END OF HIGH TENSION LEAD CONTACT.

h. CONNECT CABLE CONNECTOR (4 AND 5) TO IGNITER (3). TORQUE CABLE NUT (5) 140 TO 160 LB–IN. UNTIL SHOULDER BOTTOMS ON MATING PART.

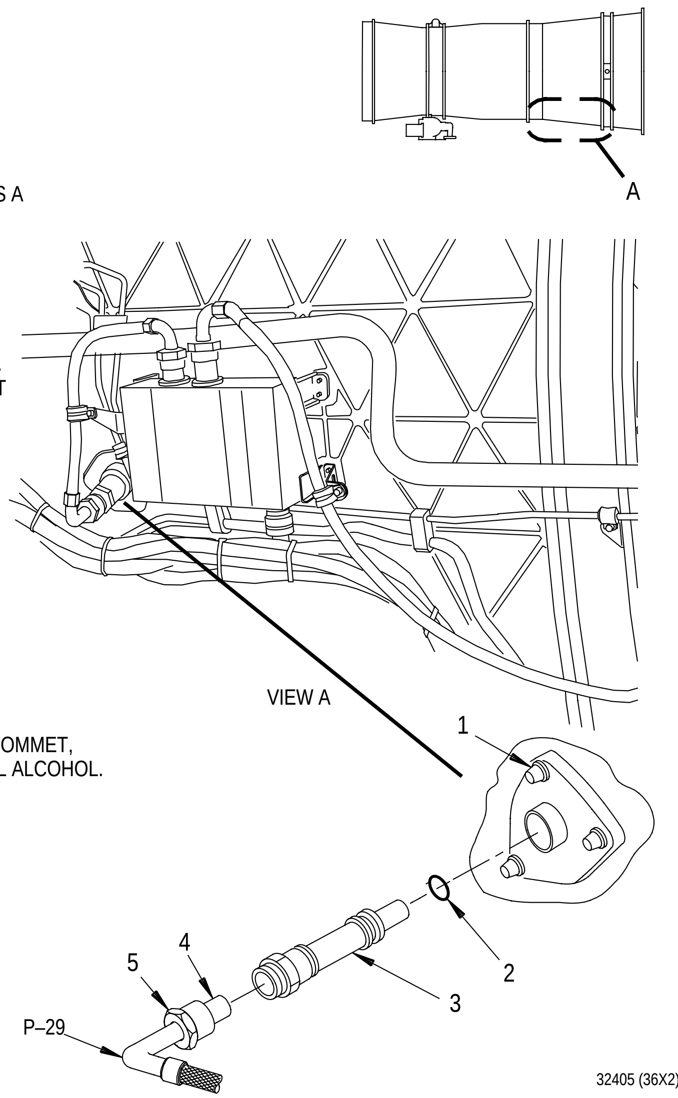


Figure 10. Gas Turbine Engine Main Spark Igniters (Engine Left Side) - Installation

8. FOLLOW-ON MAINTENANCE.

a. Perform operational check of gas turbine engine main spark igniters. Refer to T.O. 2J-F100-11-2, WP 518 00.

WORK PACKAGE

TECHNICAL PROCEDURES

IGNITER - SPARK, GAS TURBINE ENGINE, AUGMENTOR

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 12

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 4	22	5 - 11	0	12 Blank	0

REFERENCE MATERIAL REQUIRED

None

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Brush, wire	-
Cloth, lint-free	-
Compound, antigalling (PWA 550)	Hi-T-650 or Lubri-Bond HT
Cotton swabs	-
Methyl ethyl ketone	TT-M-261

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
1	Introduction	
	Ignition test set - - - - - - - - - - - - - - -	PN 137375
2	Augmentor Spark Igniter - Removal	
	Lead, shorting - - - - - - - - - - - - - - - - -	PWA 52176

NOTE

PWA 52176 lead is detail of PWA 50025 ignition test set. PN 137375 ignition test set may also be used.

ILLUSTRATED SUPPORT EQUIPMENT

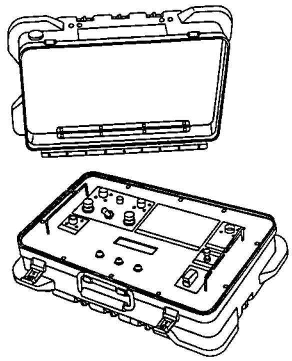


Figure T1. PN 137375 Ignition Test Set

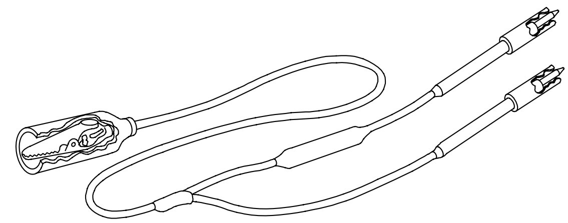


Figure T2. PWA 52176 Shorting Lead

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures for the augmentor spark igniters:

- Removal
- Cleaning
- Inspection
- Installation

NOTE

If PN 137375 ignition test set is used procedures are performed using operation and maintenance manual accompanying ignition test set.

2. GAS TURBINE ENGINE AUGMENTOR SPARK IGNITER - REMOVAL.

(See Figures 1 and 2.)

WARNING

Ignition system output voltage is dangerously high. It is important to completely discharge the voltage immediately after the exciter to augmentor igniter power cable is removed. To completely discharge voltage, wait until the system is inactive for at least 2 minutes, then ground through PWA 52176 lead.

CAUTION

Electrical cables are fragile. If the cable is bent to less than a 5 inch inside radius, the conduit can break, causing an electrical circuit failure.

NOTE

This procedure applies to either left or right side augmentor spark igniter.

a. Discharge ignition system. (See figure 1.)

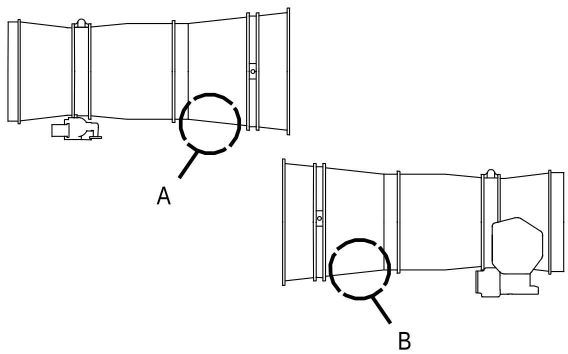
WARNING

The augmentor spark igniter is spring-loaded. Hold igniter firmly in place while removing nuts from studs to prevent igniter from popping out.

b. Hold augmentor spark igniter firmly in place and remove nuts securing ball socket seat to engine studs. (See figure 2.) Slowly remove igniter until spring tension is relieved.

c. Remove igniter, seat, ball socket seat, spacer and spring from well in rear fan duct.

d. Remove ball socket seat, spacer and spring from igniter.



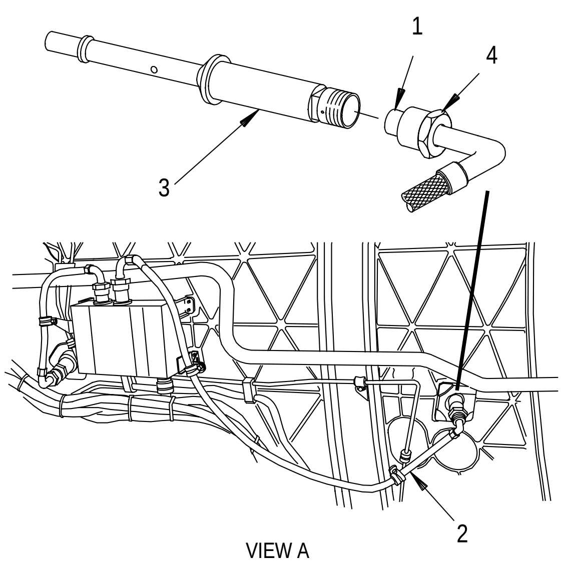
WARNING

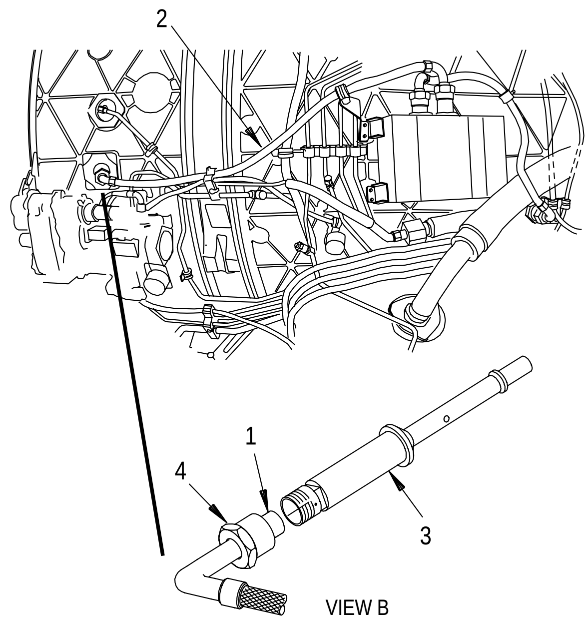
DO NOT LET CABLE TERMINAL (1) TOUCH ANY PART OF THE ENGINE. IT COULD CAUSE A HIGH VOLTAGE SPARK.

NOTE

THIS PROCEDURE APPLIES TO BOTH AUGMENTOR IGNITERS AS APPLICABLE

a. DISCONNECT CABLE (2) FROM IGNITER (3). HOLD IGNITER (3) IN PLACE WITH WRENCH WHILE LOOSENING CABLE NUT (4).



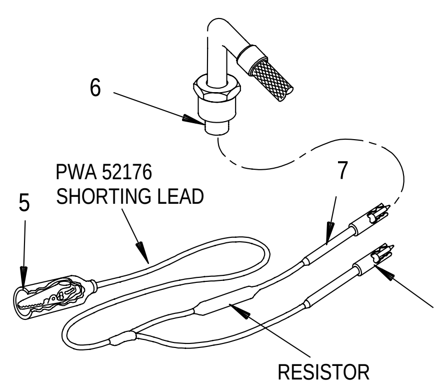


b. CONNECT ALLIGATOR GROUND CLIP (5) OF PWA 52176 SHORTING LEAD TO ENGINE GROUND (AN UNPAINTED BOLT HEAD) OR ANY STUD OF THE BALL SOCKET SEAT.

WARNING

TOUCH LEAD FIRMLY TO CABLE TERMINAL (6) TO AVOID SPARK.

c. TOUCH LEAD WITH RESISTOR (7) TO CABLE TERMINAL (6) FOR 1 MINUTE. REMOVE LEAD (7).
d. TOUCH LEAD (8) TO CABLE TERMINAL (6) FOR 1 MINUTE. REMOVE LEAD (8).
e. REMOVE CLIP (5) FROM ENGINE GROUND.



JD130X1 (48X2)

Figure 1. Gas Turbine Engine Augmentor Spark Igniter - Discharge Procedure

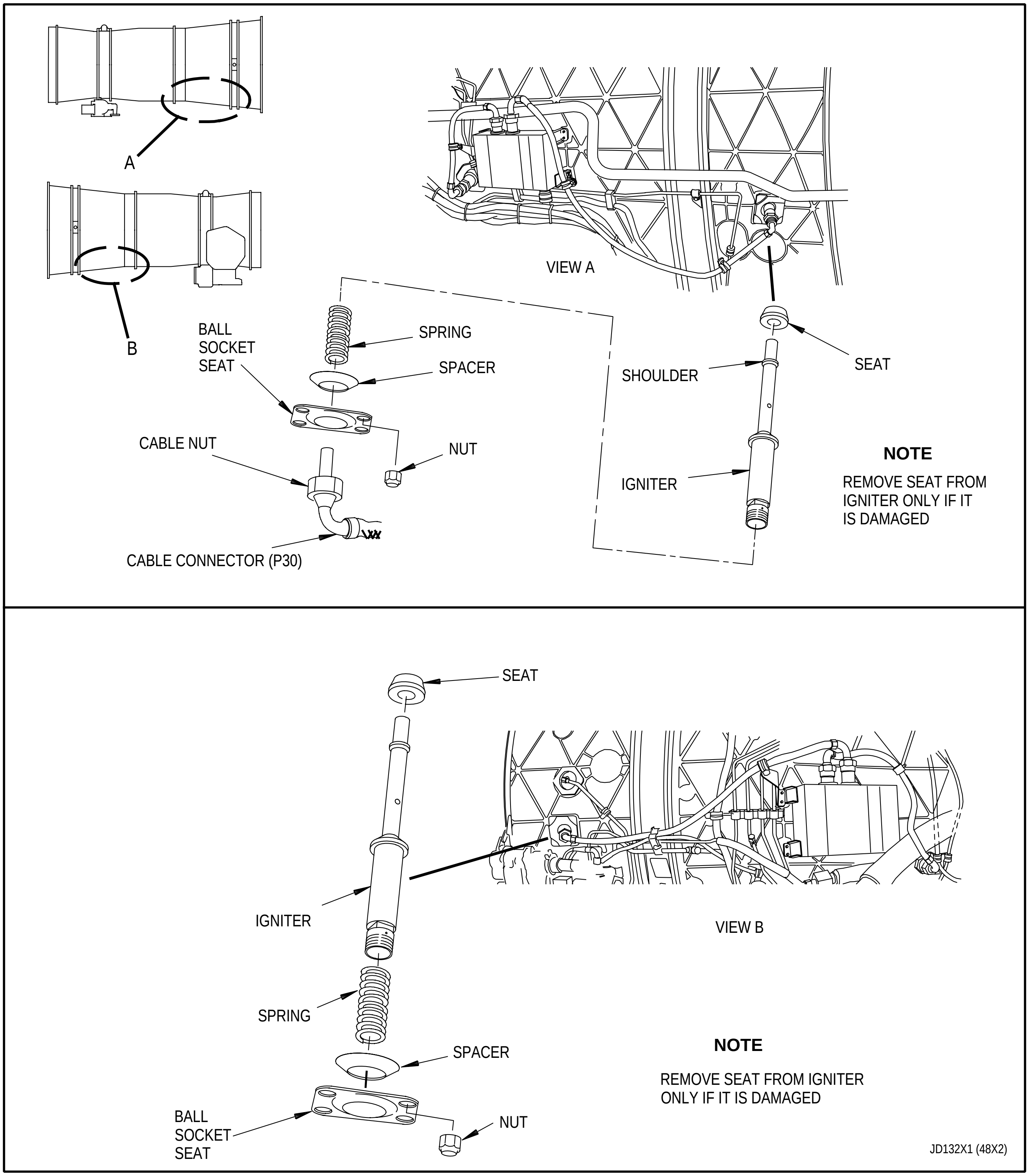


Figure 2. Gas Turbine Engine Augmentor Spark Igniter - Removal

NOTE

Remove seat from igniter only if it is damaged.

e. Using standard drift, remove seat from end of igniter.

f. Place protective closure over cable connector and over well in fan duct.

3. GAS TURBINE ENGINE AUGMENTOR SPARK IGNITER - CLEANING.
(See Figure 3.)

CAUTION

Do not use abrasive-type cleaner on spark igniter.

a. Moisten clean cloth with TT-M-261 methyl ethyl ketone.

b. Clean outer shell of spark igniter with cloth. Wipe with a clean, dry, lint-free cloth.

c. Clean stubborn spots or stains using a wire brush.

d. Clean exposed surfaces of ceramic with cloth moistened with methyl ethyl ketone. Wipe with a clean, dry, lint-free cloth.

e. Clean spark igniter terminal well using cotton swab moistened with methyl ethyl ketone. Dry with clean, compressed air.

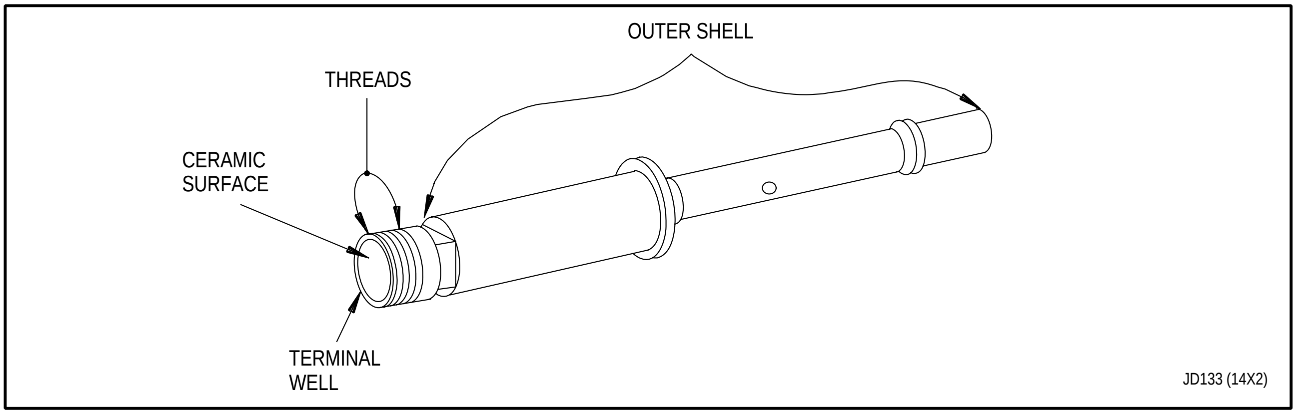


Figure 3. Gas Turbine Engine Augmentor Spark Igniter - Cleaning

4. GAS TURBINE ENGINE AUGMENTOR SPARK IGNITER - INSPECTION.

(See Figure 4.)

a. To see if igniter is broken internally, shake it and listen for a rattle. Ignore a faint rattle caused by the high tolerance fit of the center electrode to the ceramic insulation. If the igniter definitely rattles, replace it.

b. Inspect igniter. (See figure 4.)

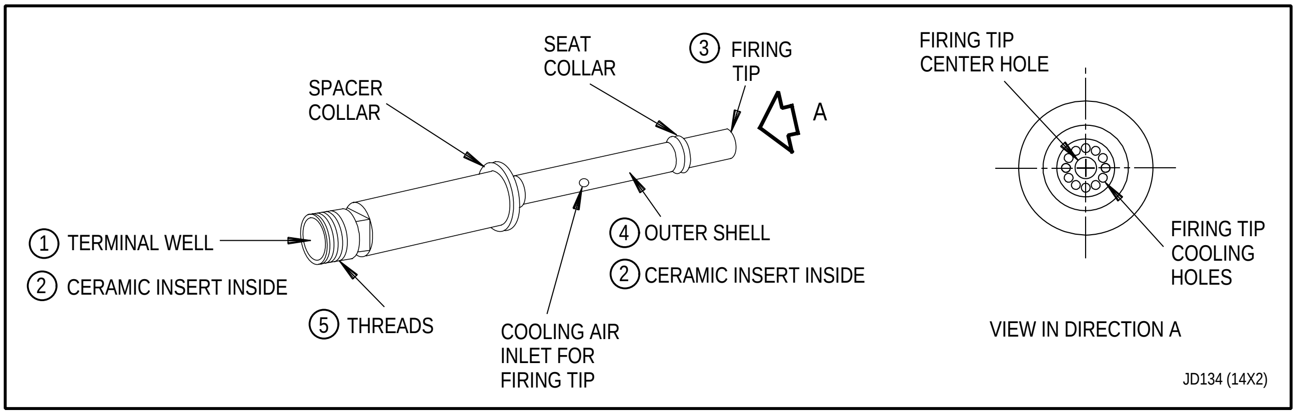


Figure 4. Gas Turbine Engine Augumentor Spark Igniter - Inspection

Legend for figure 4

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Terminal well -			
Arcing, carbon tracking	Not serviceable	Not reparable	Replace igniter.
Dirt or contaminants	Not serviceable	Reparable	Clean per paragraph 3.
2. Ceramic insert inside -			
Cracks, missing pieces	Not serviceable	Not reparable	Replace igniter.
3. Firing tip -			
Centerhole	0.230 inch diameter maximum	Not reparable	Replace igniter if hole diameter is over limit.
4. Outer shell -			
Wear between spacer collar and seat collar	0.020 inch depth at any location	Not reparable	Replace igniter.
Wear between seat collar and igniter tip	Any wear up to, but not wearing into, the igniter tip cooling holes	Not reparable	Replace igniter.
5. Threads -			
Missing	Up to 1/2 of approach threads	Not reparable	Replace igniter.

5. GAS TURBINE ENGINE AUGMENTOR SPARK IGNITER - INSTALLATION.

(See Figure 5.)

NOTE

This procedure applies to either left or right side augmentor spark igniter.

a. If removed, install seat on augmentor igniter as follows. (See figure 5.)

(1) Place seat in hot oil bath, 225° to 250°F (107° to 121°C) for 10 to 15 minutes.

(2) Remove seat from hot oil bath. Remove excess oil. Immediately place seat on small end of igniter, flat side first, and press in place until seated against shoulder.

b. Put a light coat of PWA 550 antigalling compound on fan duct igniter mounting studs.

c. Place spring over igniter, making certain spring is against large shoulder of igniter.

d. Place spacer on igniter, flat side against spring.

e. Position ball socket seat in place over spacer. Remove protective closure from well in rear fan duct where igniter is installed.

f. Install assembled igniter, spring, spring spacer, and ball socket seat into opening of rear fan duct so that mounting studs of fan duct are inserted into holes of ball socket seat and tip of igniter is inserted into hole of augmentor flameholder.

g. Install nuts on studs and torque 54 to 60 pound-inches.

h. Remove protective closure from cable connector P30 or P135 as applicable.

i. Connect cable connector to spark igniter while holding igniter in place with wrench. Torque coupling nut of cable connector 140 to 160 pound-inches until coupling nut is seated.

j. Look through augmentor to see if igniter protrudes through flameholder.

k. If igniter is not seated properly in flameholder, firmly grip igniter barrel and pull outward to compress spring. Align igniter with flameholder hole. Gently release igniter so that igniter tip seats in hole in flameholder.

l. Look again to ensure igniter tip is seated properly in flameholder.

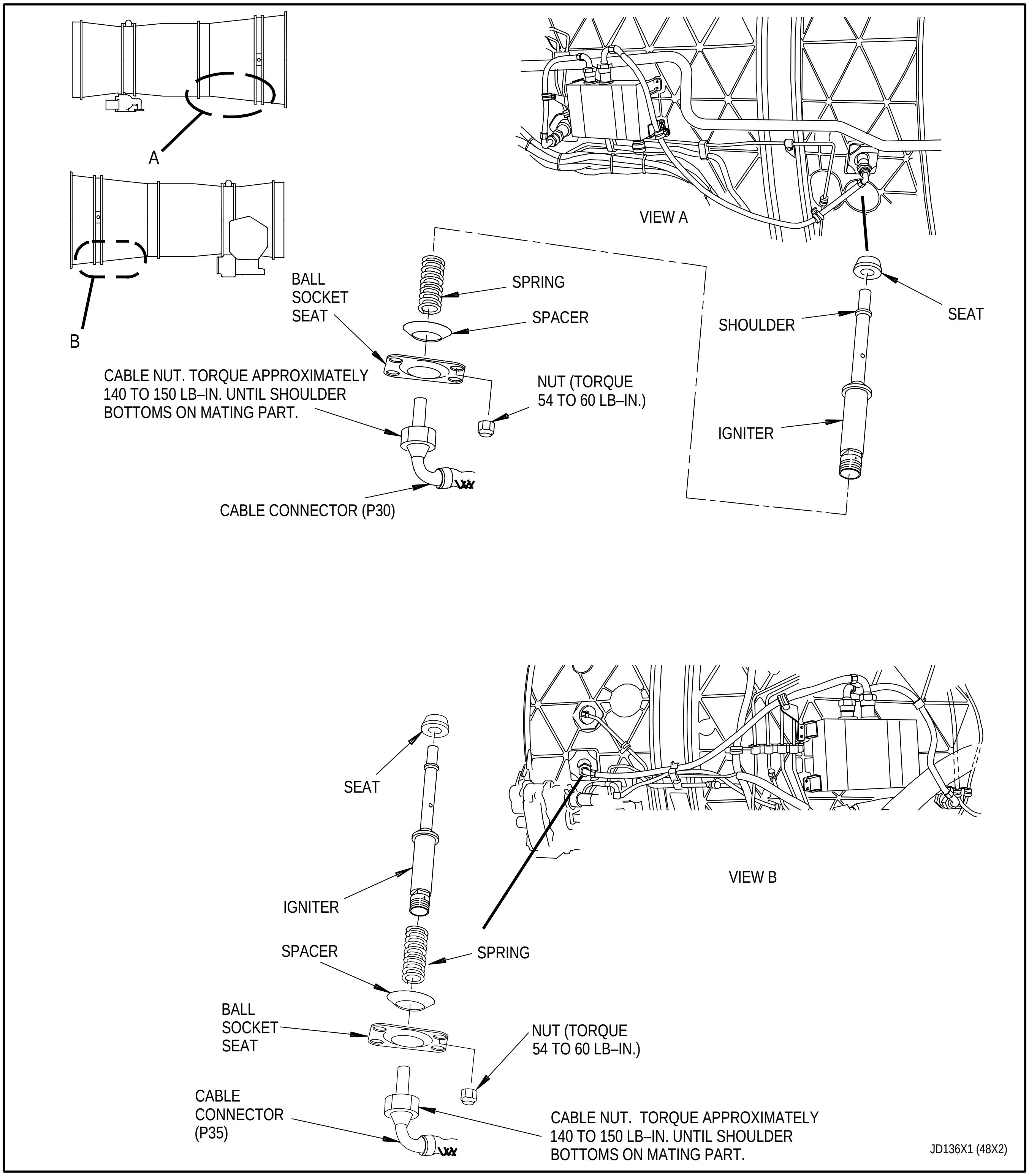


Figure 5. Turbine Engine Augmentor Spark Igniter - Installation

WORK PACKAGE

TECHNICAL PROCEDURES

EXCITERS - IGNITION, DUAL

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 18

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	22	5	22	11 - 12	2
2	21	6 - 9	0	13 - 17	0
3	22	10	21	18 Blank	2
4	0				

REFERENCE MATERIAL REQUIRED

None

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Alcohol, denatured	O-E-T60, Type III
Alcohol, isopropyl	TT-I-735 Grade A or PMC 9016
Brush, nonmetallic	-
Cloth, lint-free	-
Compound, antigalling (PWA 550)	Hi-T-650 or Lubri Bond HT
Rod, rubberized, abrasive or equivalent	Cratex 086m
Solvent, dielectric	PMC 8910
Solvent, petroleum	P-D-680, Type II

EXPENDABLE ITEMS

None

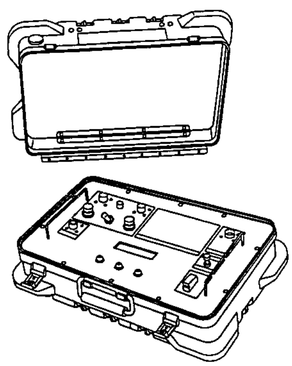
APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
2	Dual Ignition Exciter - Removal	
	Lead, shorting -----------------	PWA 52176 or
	Ignition Test Set ---------------	PN 137375

NOTE

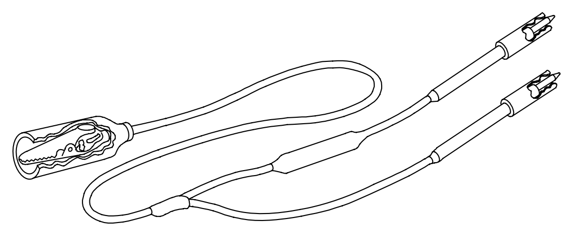
PWA 52176 lead is detail of PWA 50025 ignition test set. PN 137375 ignition test set may also be used.

ILLUSTRATED SUPPORT EQUIPMENT



PN 137375 –C

Figure T1. PN 137375 Ignition Test Set



PWA 52176 –C

Figure T1A. PWA 52176 Shorting Lead

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures for the two dual ignition exciters:

- Removal
- Removal of attaching parts
- Cleaning
- Inspection
- Engine mounting bracket assembly and exciter angle bracket - Replacement
- Installation of attaching parts
- Installation

2. DUAL IGNITION EXCITER - REMOVAL.

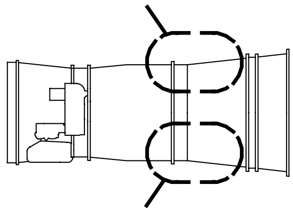
(See Figures 1 and 2.)

NOTE

If PN 137375 ignition test set is used procedures are performed using operation and maintenance manual accompanying ignition test set.

a. Do not bend special purpose electrical cable to less than a 5 inch radius. Inner conductors or outer wire braid may be damaged if cable is bent to a smaller radius.

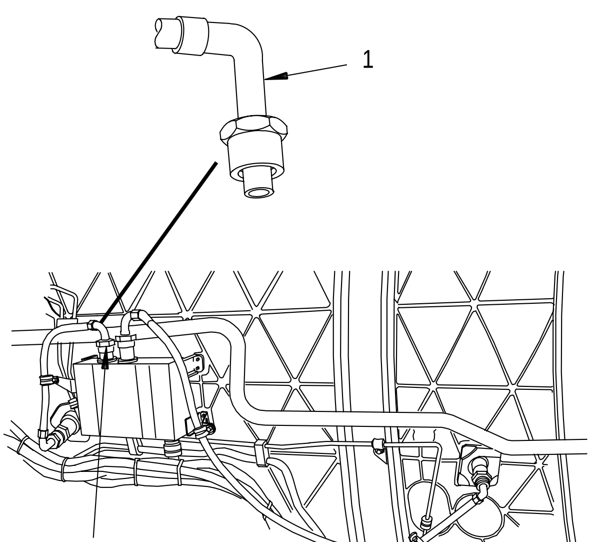
b. Discharge both dual ignition exciters. (See figure 1.)



WARNING

ENSURE THAT NO EXPLOSIVES, FLAMMABLE GAS OR LIQUIDS ARE IN AREA DURING THIS PROCEDURE.

a. DISCONNECT EXCITER TO IGNITER ELECTRICAL POWER CABLE (1) FROM DUAL IGNITION EXCITER RECEPTACLE J27 (2).



VIEW A
(TYPICAL–BOTH SIDES)

b. CONNECT ALLIGATOR GROUND CLIP (4) OF PWA 52176 SHORTING LEAD TO ENGINE GROUND (AN UNPAINTED BOLT HEAD) OR EXCITER BRACKET.

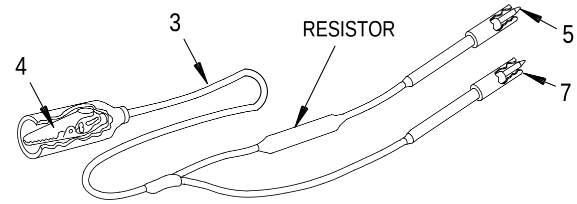
WARNING

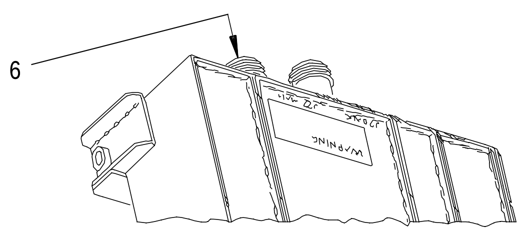
TO AVOID SPARK, LEAD (5, LEAD WITH RESISTOR) SHALL BE HELD FIRMLY TO TERMINAL IN EXCITER RECEPTACLE J27 (6).

NOTE

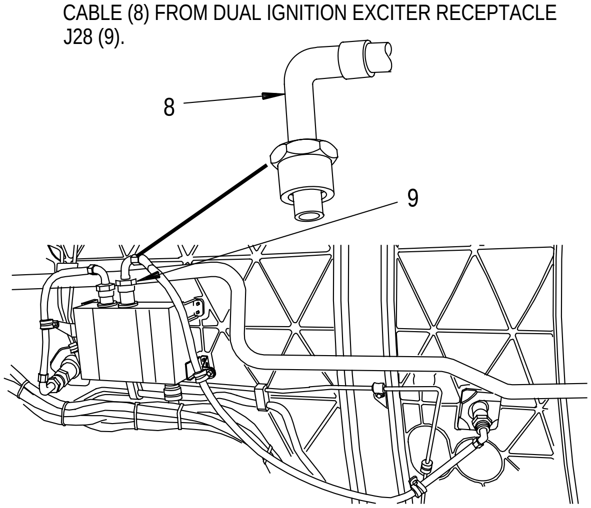
c. TOUCH LEAD (5, LEAD WITH RESISTOR) FIRMLY TO TERMINAL IN EXCITER RECEPTACLE J27 (6) FOR APPROXIMATELY 1 MINUTE, THEN REMOVE.

d. TOUCH LEAD (7) FIRMLY TO TERMINAL IN EXCITER RECEPTACLE J27 (6) FOR APPROXIMATELY 1 MINUTE, THEN REMOVE.





e. DISCONNECT EXCITER TO IGNITER ELECTRICAL POWER CABLE (8) FROM DUAL IGNITION EXCITER RECEPTACLE J28 (9).



JD110X2 (51X2)

Figure 1. Dual Ignition Exciters - Electrical Discharge Procedure (Sheet 1 of 2)

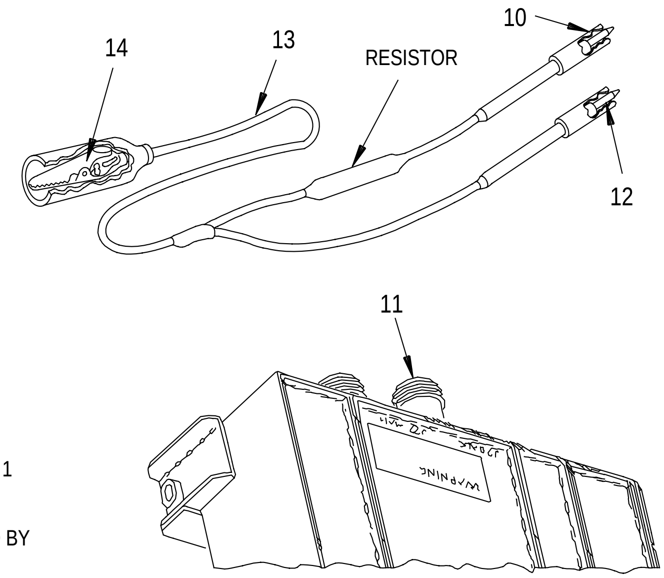
WARNING

TO AVOID SPARK, RESISTOR PROBE LEAD (10) SHALL BE HELD FIRMLY ON TERMINAL IN EXCITER RECEPTACLE J28 (11).

f. TOUCH LEAD (10, LEAD WITH RESISTOR) FIRMLY TO TERMINAL IN EXCITER RECEPTACLE J28 (11) FOR APPROXIMATELY 1 MINUTE, THEN REMOVE.

g. TOUCH GROUND LEAD (12) FIRMLY TO TERMINAL IN EXCITER RECEPTACLE J28 (11) FOR APPROXIMATELY 1 MINUTE, THEN REMOVE.

h. REMOVE SHORTING LEAD (13) FROM ENGINE GROUND BY RELEASING CLIP (14).



JD111X4 (24X2)

Figure 1. Dual Ignition Exciters - Electrical Discharge Procedure (Sheet 2 of 2)

c. Disconnect cable connector P26 from exciters. (See figure 2.)

d. Remove three bolts and two washers securing exciter to brackets.

e. Remove exciters. Place protective closures over exciter connector receptacles and over cable connectors P26, P27, and P28.

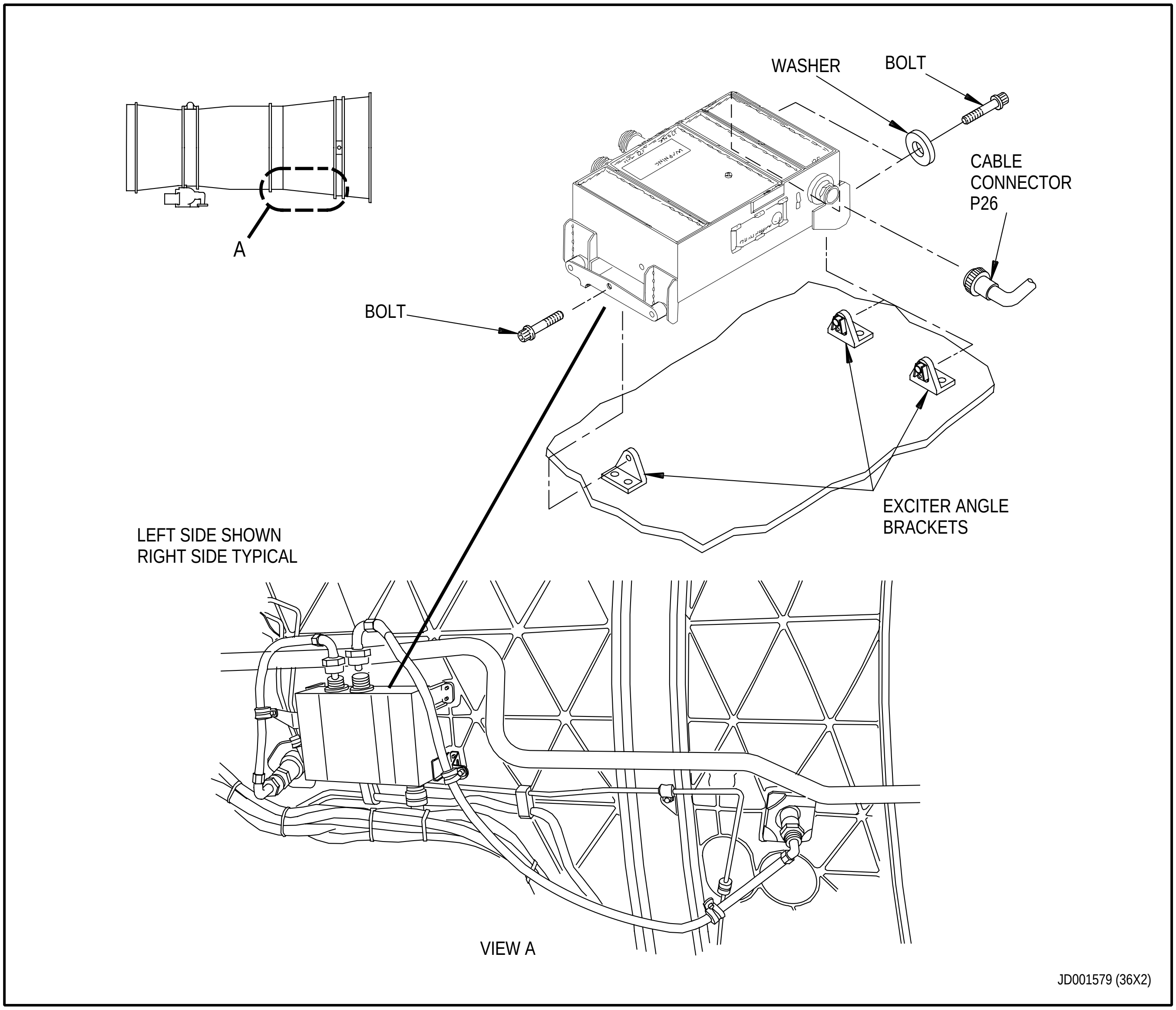


Figure 2. Dual Ignition Exciter - Removal (Typical)

3. DUAL IGNITION EXCITER - REMOVAL OF ATTACHING PARTS.
(See Figure 3.)

a. Remove bolts, washers, and nuts securing ignition exciter retaining plate to forward side of exciter.

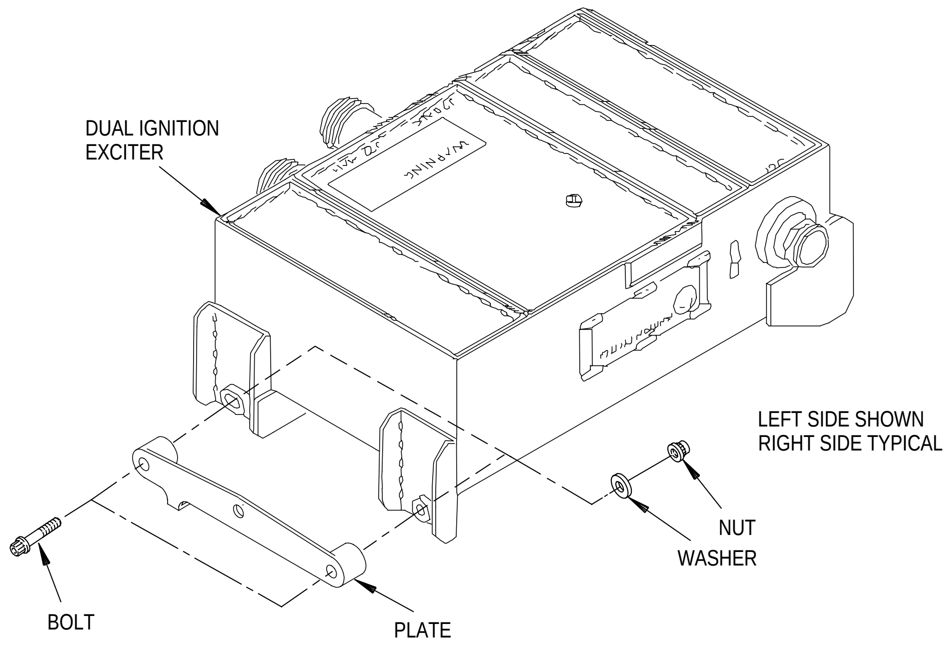


Figure 3. Dual Ignition Exciter - Removal of Attaching Parts

4. DUAL IGNITION EXCITER - CLEANING.

a. Wipe exterior of unit with clean cloth moistened with P-D-680, Type II petroleum solvent.

b. Dry with clean, dry, lint-free cloth.

c. Clean well of output receptacles on igniter exciter as follows:

(1) Remove protective closures.

(2) Scrub contact well with long bristle, nonmetallic brush moistened with isopropyl alcohol TT-I-735 Grade A, or PMC 9016, or dielectric solvent PMC 8910. Blow dry, if necessary, with clean air at 30 psi or less.

CAUTION

When cleaning output well contact button, care must be taken not to remove material from terminal walls.

(3) Using a 1/2-inch diameter, 4-inch long rubberized rod (Cratex 086m or equivalent), clean terminal output well contact button by hand in a circular motion.

(4) Using circular felt bob, 1/2 inch diameter and 1-3/4 inches long, suitable for use with hand chuck, moistened with isopropyl alcohol TT-I-735 Grade A, or PMC 9016, or dielectric solvent PMC 8910, clean inner ceramic walls with circular motion.

(5) Clean end surface of ceramic where grommet face seals with short bristle, nonmetallic brush moistened with isopropyl alcohol TT-I-735 Grade A, or PMC 9016, or dielectric solvent PMC 8910.

(6) Dry with clean compressed air at less than 30 psig.

d. Replace protective closures on receptacles.

e. Remove protective closures from input receptacle and cable connectors.

f. Clean connector pins, socket and cable insulation with O-E-760, Type III, denatured alcohol or O-T-620 Trichloroethane inhibited-1, 1, 1 (trichlorotrifluoroethane) degreaser. Dry with clean compressed air at less than 30 psig.

g. Replace protective closures on input receptacle and cable connector.

5. DUAL IGNITION EXCITER - INSPECTION. (See Figure 4.)

a. Remove protective closures from dual ignition exciter receptacles.

b. Inspect exciter. (See figure 4.)

c. Remove protective cover from cable connector P26 and inspect. Refer to WP 019 00.

d. Inspect exciter angle bracket and exciter angle bracket assemblies on rear fan duct for cracks and wear on bracket pins. Replace brackets having cracks.

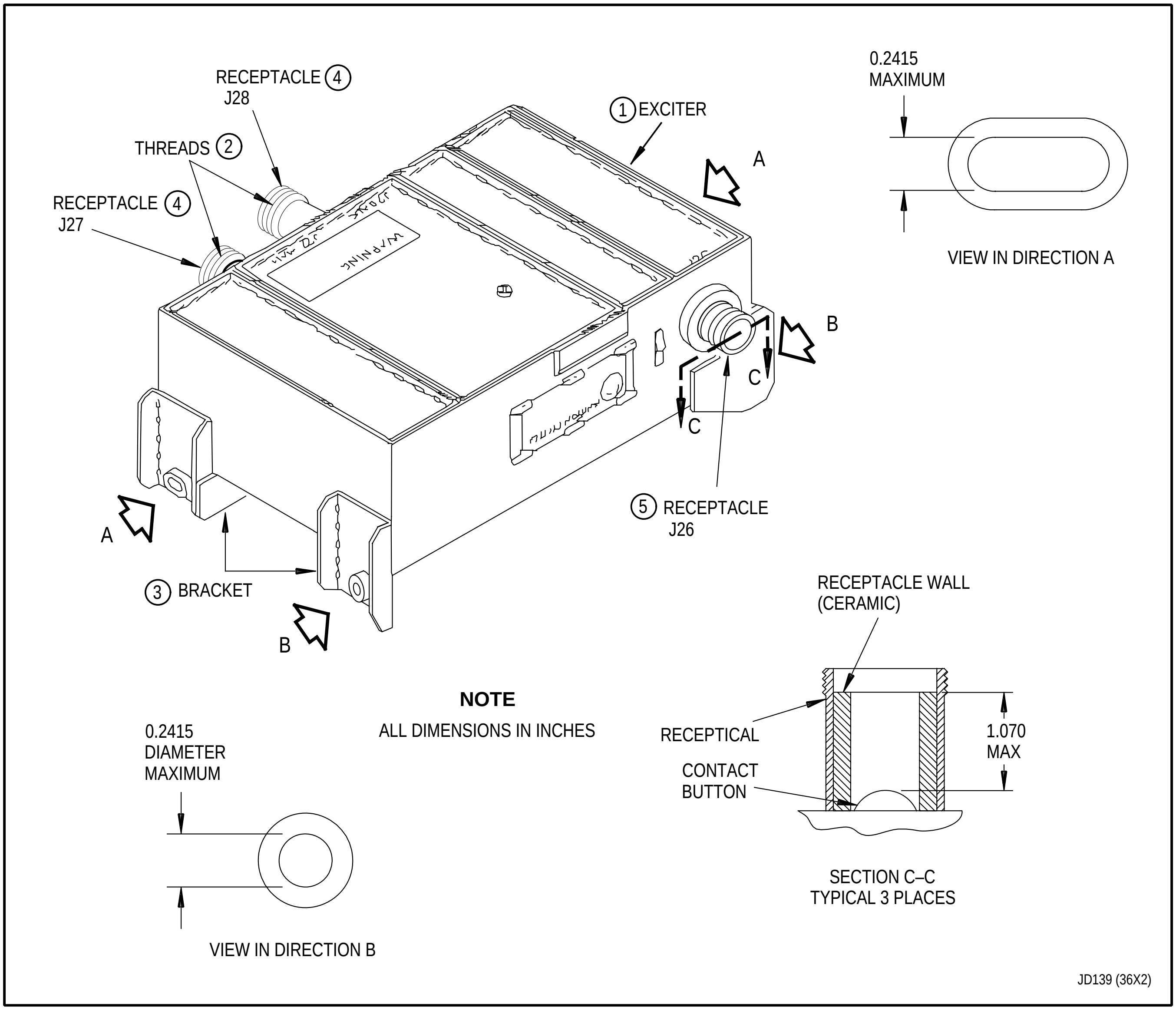


Figure 4. Dual Ignition Exciter - Inspection

Legend for figure 4

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Exciter -			
Dented, cracked	Not serviceable	Not reparable	Replace exciter.
2. Threads -			
Broken, crossed, or dented	Not serviceable	Minor thread damage may be repaired with thread chaser.	Replace exciter.
3. Bracket -			
Cracked	Not serviceable	Not reparable	Replace exciter.
Worn in bracket hole	Limit shown in Views A and B	Not reparable	Replace exciter if hole is over maximum limit.
4. Receptacles J26, J27, and J28 -			
Carbon track in receptacle well	Not serviceable	None	Clean per paragraph 4.
Cracked or broken ceramic	Not serviceable	Not reparable	Replace exciter.
Pitted contact button in receptacle well	Not serviceable	1.070 inches receptacle well depth (view in direction C	Replace exciter.

6. EXCITER ANGLE BRACKET ASSEMBLY AND EXCITER ANGLE BRACKET - REPLACEMENT. (See Figure 5.)

NOTE

This procedure applies to dual ignition exciter brackets on either left or right side of engine, as required.

a. If required, remove bolts and nuts securing tube clamps to loop clamp brackets. (See figure 5.)

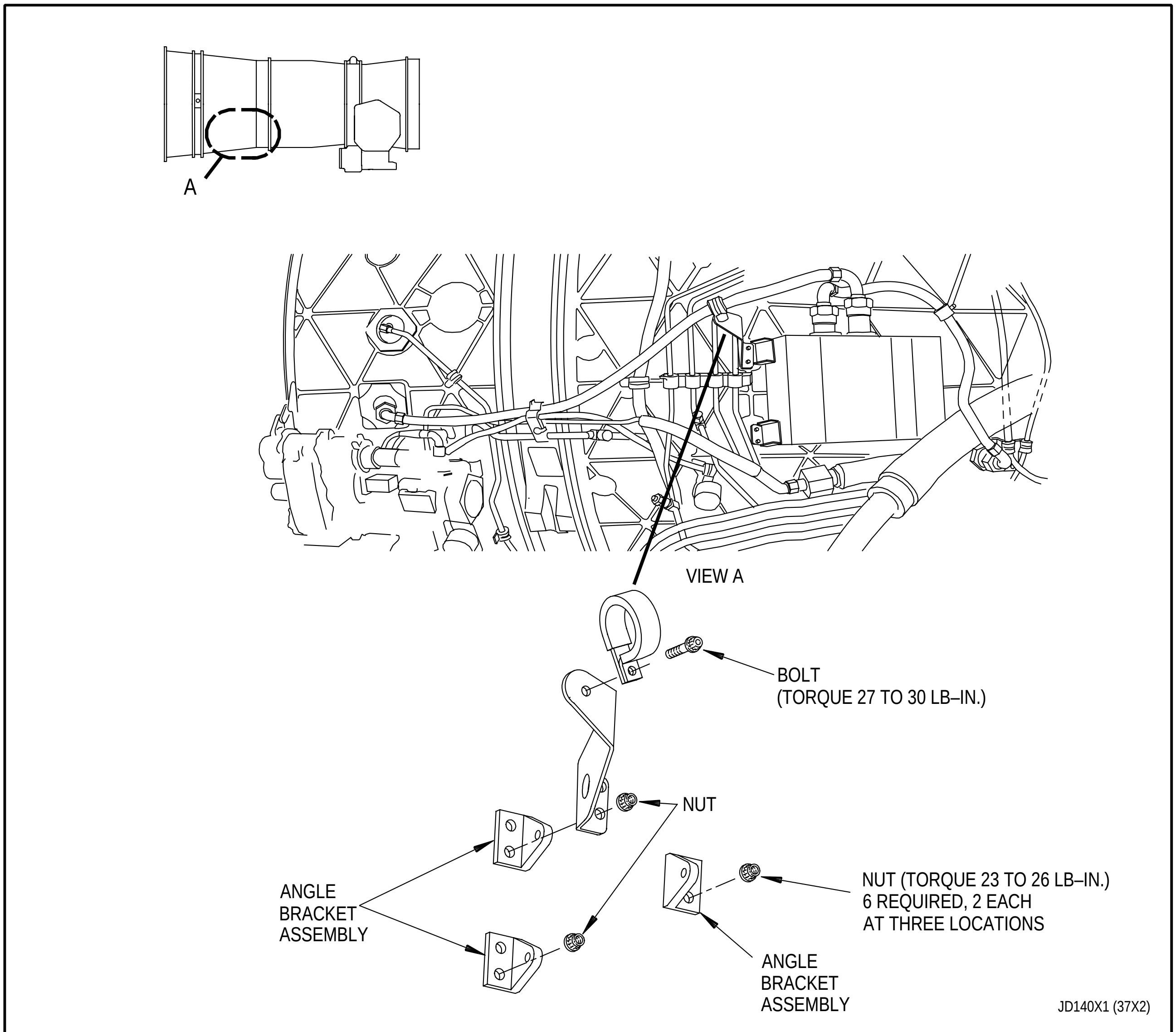


Figure 5. Exciter Angle Bracket Assemblies - Replacement (Sheet 1 of 2)

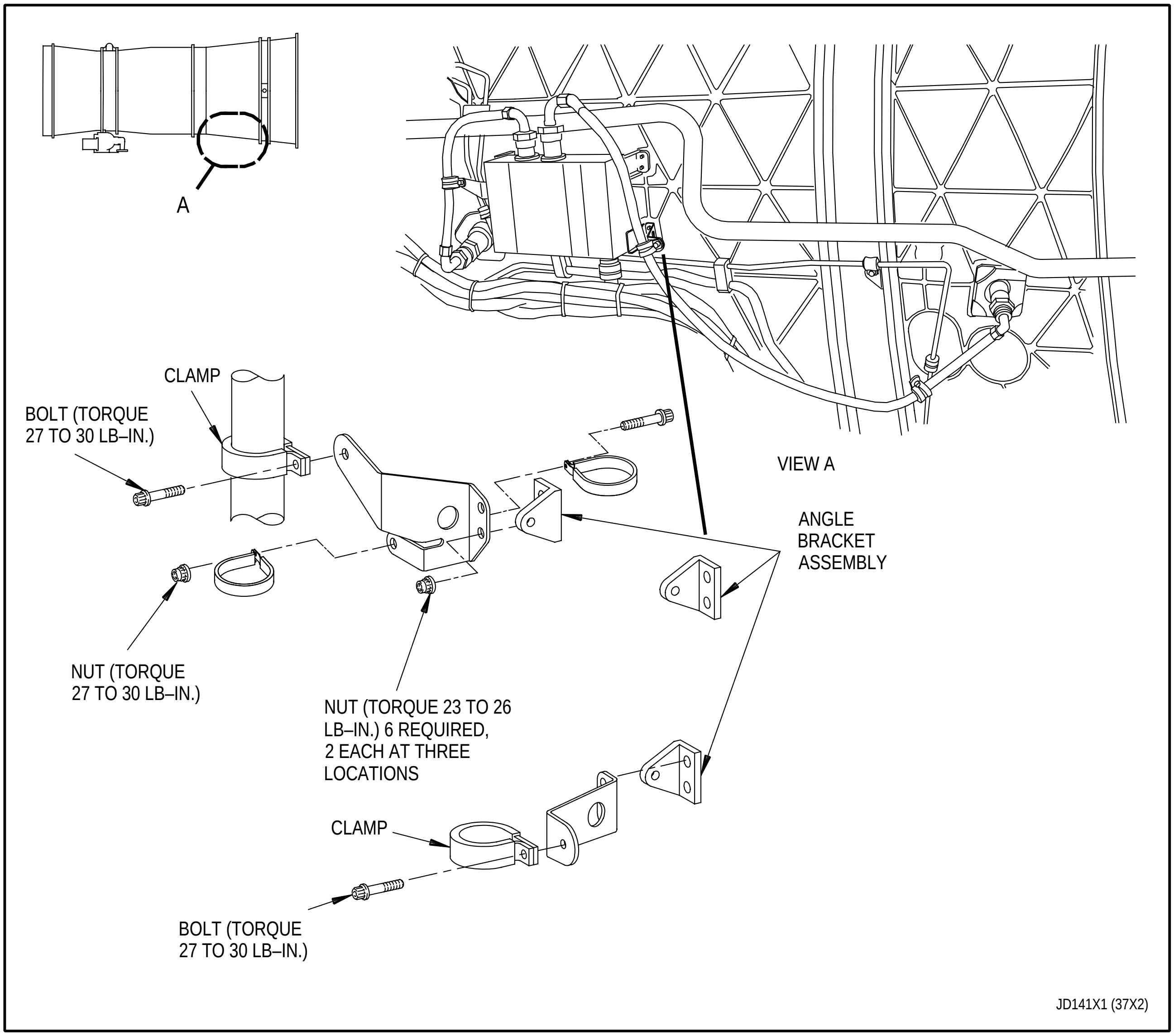


Figure 5. Exciter Angle Bracket Assemblies - Replacement (Sheet 2 of 2)

b. Remove nuts securing loop clamp bracket and angle bracket assembly to engine. Remove bracket. Retain loop clamp bracket if installed.

c. Apply a light coat of PWA 550 antigalling compound to studs. Remove excess.

d. Position replacement angle bracket assembly on studs and reinstall loop clamp bracket if required.

e. Install nuts and torque 23 to 26 pound-inches.

f. If required, install tube clamps to loop clamp bracket with bolt and nut. Torque nut 27 to 30 pound-inches.

7. DUAL IGNITION EXCITER - INSTALLATION OF ATTACHING PARTS.

(See Figure 6.)

a. Apply a light coat of PWA 550 antigalling compound to bolts. Remove excess.

b. Install ignition exciter retaining plate to forward side of exciter with bolts, washers, and nuts.

c. Torque nuts 27 to 30 pound-inches.

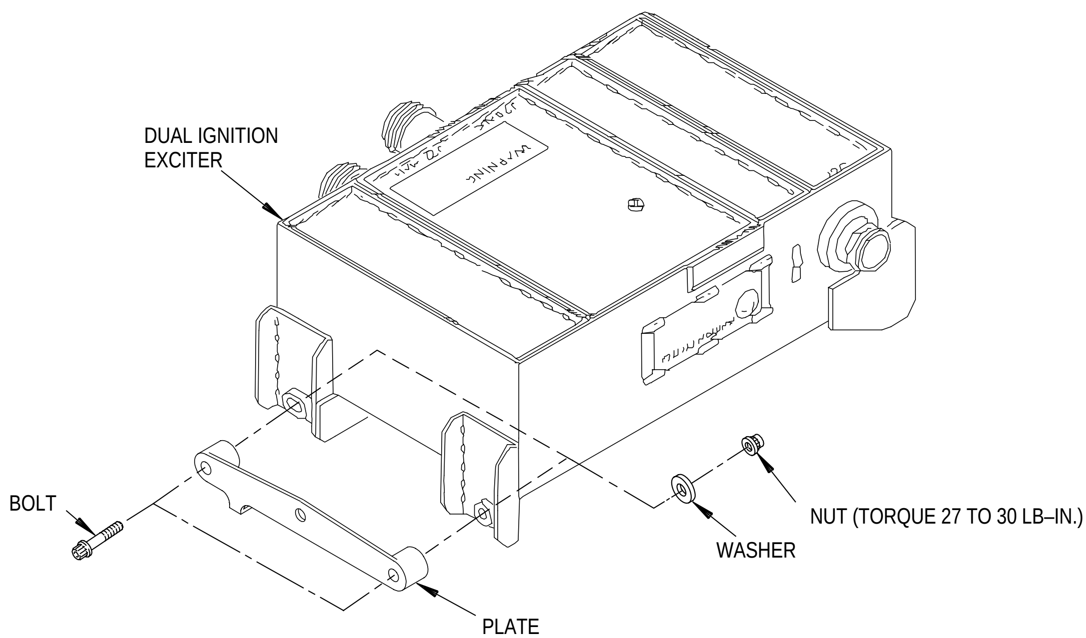


Figure 6. Dual Ignition Exciter - Installation of Attaching Parts

8. DUAL IGNITION EXCITER - INSTALLATION. (See Figure 7.)

NOTE

This procedure applies to dual ignition exciters on either left or right side of engine, as required.

a. Remove protective closures from exciter connector receptacles, and from cable connectors P26, P27, and P28.

b. Put a light coat of PWA 550 antigalling compound on threads of three exciter mounting bolts.

c. Position dual ignition exciter in place, side having two connector receptacles up. Install three bolts and two washers.

d. Torque bolts 27 to 30 pound-inches.

e. Connect cable connectors P27 and P28 to two upper receptacles of exciter. Torque coupling nuts 140 to 160 pound-inches until connector shoulder bottoms on mating part.

f. Connect cable connector P26 to lower exciter receptacle as follows:

(1) Align keyways and handtighten connector.

(2) Ensure red line on receptacle is not visible when viewed at right angles.

(3) Tighten connector firmly with soft-jawed pliers.

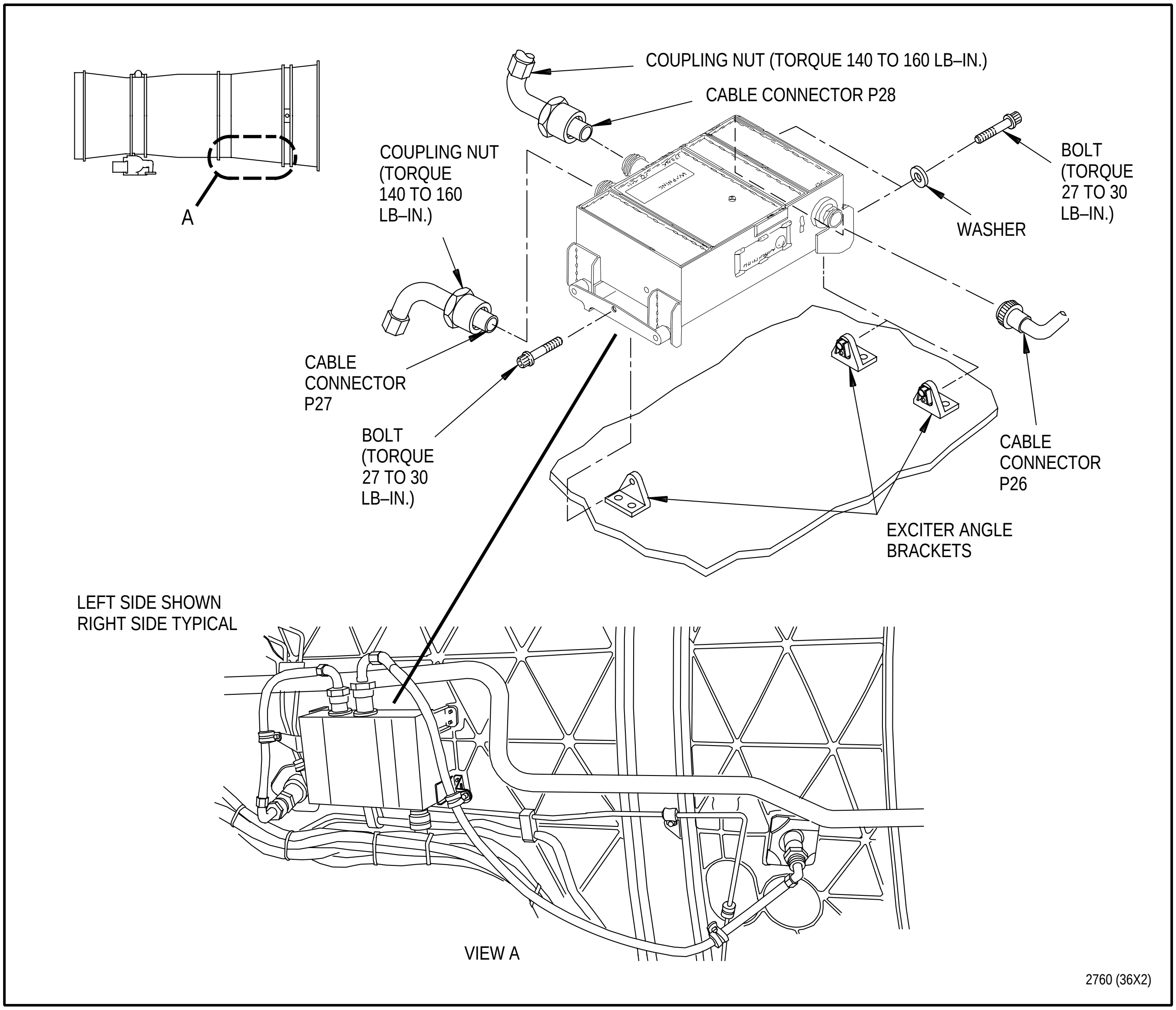


Figure 7. Dual Ignition Exciter - Installation (Typical)

WORK PACKAGE

TECHNICAL PROCEDURES

VALVE ASSEMBLY - BREATHER PRESSURIZING

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 12

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2	18	5	18	10 - 11	18
3	0	6 - 9	0	12 Blank	0
4	2				

REFERENCE MATERIAL REQUIRED

None

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

T. O. No.	Date	Level	Title (ECP No.)
2J-F100229-565	15 FEB 96	O/I	Retrofit of Gearbox Oil Supply Tubes and Manifolds For Improved Gearbox Oil Flow, F100-PW-229 Engine, F-16 Aircraft (ECP 94QA075)

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
CLOTH, LINT-FREE	-
COMPOUND, ANTIGALLING, (PWA 550)	HI-T-650 OR LUBRI-BOND HT
COMPOUND, SEALING (PWA 36000-3 OR PWA 36000-2)	HYLOMAR-UNIVERSAL JOINTING COMPOUND
LOCKWIRE(0.032 INCH DIAMETER)	MS9226-04
OIL, LUBRICATING	MIL-L-7808 OR
PETROLATUM	VV-P-236
SOLVENT, PETROLEUM	P-D-680, TYPE II

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
PACKING, PREFORMED	ST1001-04	2
PACKING, PREFORMED	ST1050-145	1

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures for breather pressurizing valve:

- Removal
- Removal of attaching parts
- Cleaning
- Breather pressurizing valve assembly - Inspection
- Breather pressurizing valve housing - Inspection
- Installation of attaching parts
- Installation

2. BREATHER PRESSURIZING VALVE ASSEMBLY - REMOVAL.
(See Figure 1.)

a. Use a container to catch any residual oil left in gearbox drain manifold and breather pressurizing valve assembly and housing.

b. Slowly and carefully disconnect gearbox drain manifold from housing adapter. Place protective closure on tube.

CAUTION

Remove breather pressurizing valve assembly by hand only. Prying with tools will damage mount surfaces.

NOTE

Block clamp will remain attached to electrical cables and Tt2 capillary tube.

c. Remove nuts and washers securing brackets, breather pressurizing valve, and housing to gearbox. Discard washers securing tube support bracket. Remove housing and valve from gearbox. Discard packing. Place protective closure on gearbox.

d. Drain residual oil left in valve and housing.

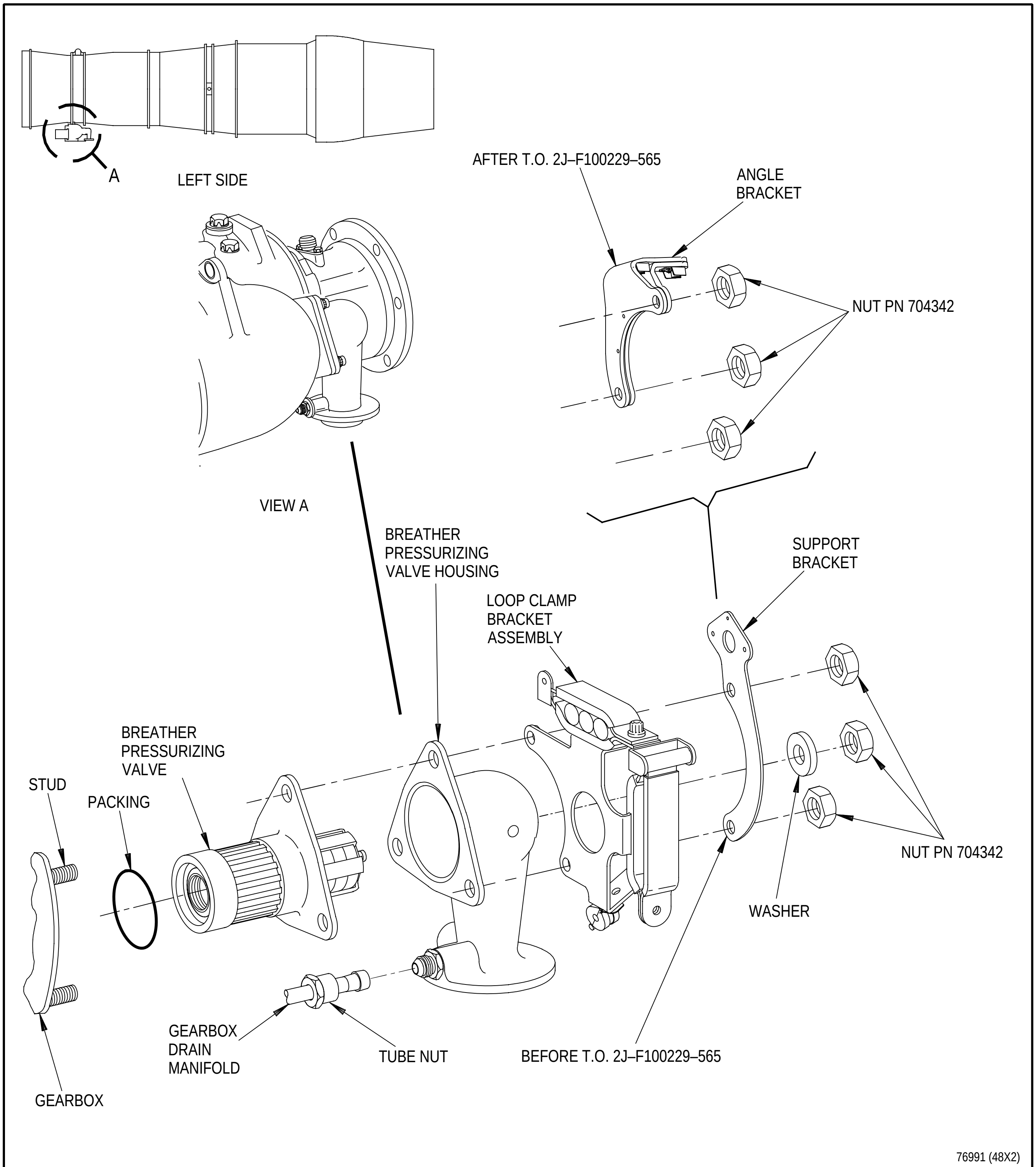


Figure 1. Breather Pressurizing Valve Assembly - Removal

3. BREATHER PRESSURIZING VALVE ASSEMBLY - REMOVAL OF ATTACHING PARTS. (See Figure 2.)

a. Remove tube adapter and plug from valve housing. Remove and discard packings. (See figure 2.)

b. Place protective closure over valve housing.

4. BREATHER PRESSURIZING VALVE ASSEMBLY - CLEANING.

a. Using a clean cloth moistened with P-D-680, Type II petroleum solvent, wipe the outside of the breather pressurizing valve and valve housing.

b. Dry valve and valve housing with a clean, dry lint-free cloth.

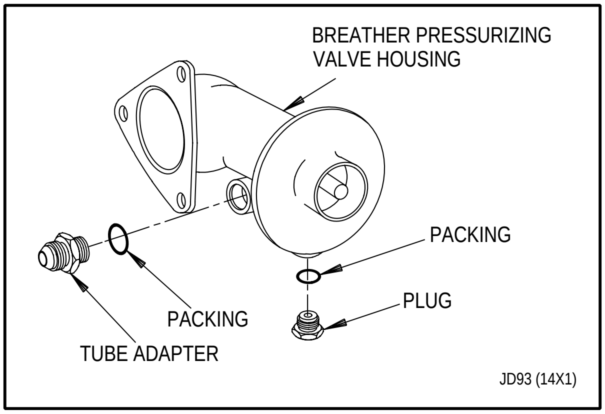
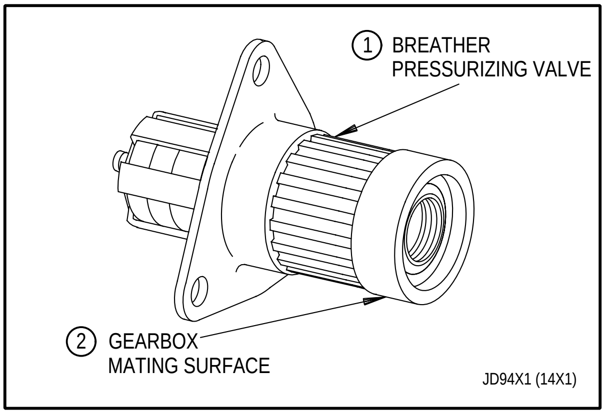


Figure 2. Breather Pressurizing Valve Housing - Removal of Attaching Parts

5. BREATHER PRESSURIZING VALVE ASSEMBLY - INSPECTION.
(See Figure 3.)

a. Inspect breather pressurizing valve assembly. (See figure 3.)



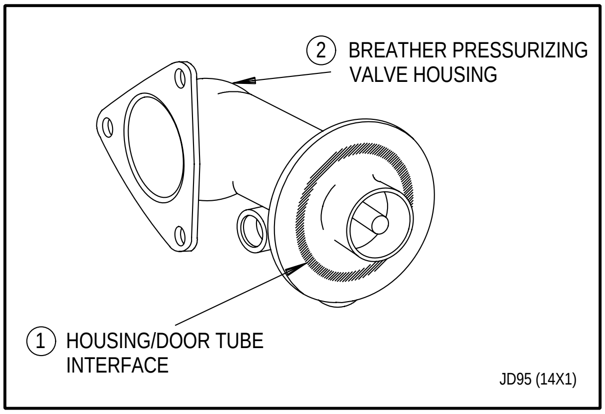
Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Breather pressurizing valve -			
Loss of spring compression	Not serviceable	Not reparable	Replace valve.
2. Gearbox mating surface -			
Scratches,chips, andcracks	Not serviceable	Not reparable	Replace valve.

Figure 3. Breather Pressurizing Valve - Inspection

6. BREATHER PRESSURIZING VALVE HOUSING - INSPECTION.

(See Figure 4.)

a. Inspect breather pressurizing valve housing. (See figure 4.)



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Housing/door tube interface -			
Wear rings or patterns	Not to exceed 0.035 inch deep with a total wear width in any one area not to exceed 0.400 inch.	Not reparable	Replace housing.
2. Breather pressurizing valve housing -			
Cracks	Not serviceable	Note reparable	Replace housing.

Figure 4. Breather Pressurizing Valve Housing - Inspection

7. BREATHER PRESSURIZING VALVE HOUSING - INSTALLATION OF ATTACHING PARTS.
(See Figure 5.)

a. Lubricate two PN ST1001-04 packings with a light coat of MIL-L-7808 oil, or VV-P-236 petrolatum. Install packing on tube adapter and plug.

b. Remove protective closure from breather pressurizing valve housing. Lubricate threads of tube adapter and plug with a light coat of MIL-L-7808 oil or VV-P-236 petrolatum.

c. Install tube adapter and plug in ports of valve housing and torque as shown in figure 5. Lockwire plug with PN MS9226-04 wire.

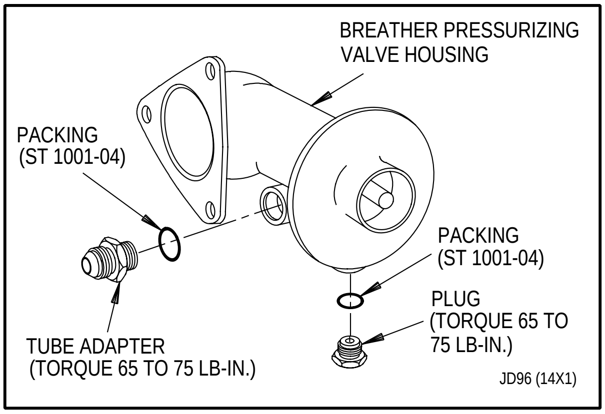


Figure 5. Breather Pressurizing Valve Housing - Installation of Attaching Parts

8. BREATHER PRESSURIZING VALVE ASSEMBLY - INSTALLATION.
(See Figure 6.)

a. Lubricate PN ST1050-145 packing with a light coat of MIL-L-7808 oil or VV-P-236 petrolatum. Install packing in groove of mating flange between gearbox and valve.

b. Coat threads of mounting studs on gearbox with PWA 550 antigalling compound.

c. Using clean, lint free cloth, moistened with P-D-680, clean mating flanges of breather pressuring valve and breather pressurizing valve housing.

d. Remove protective closure from gearbox. Insert valve into gearbox, aligning valve flange over gearbox studs.

e. Apply an even continuous coat of PWA 36000-2 or -3 sealing compound to flange face of breather pressurizing valve housing. Compound shall cover minimum 50% of flange area for all 360 degrees. Wait 10 minutes before assembly.

f. Position housing, valve, and brackets on gearbox studs. Bolt loop clamp bracket assembly to tube support bracket.

g. Install nuts on studs. Torque nuts 45 to 60 pound-inches. Wait 10 minutes. Torque nuts 45 to 60 pound-inches. Lockwire nuts using MS9226-04 lockwire.

h. Coat threads of gearbox drain manifold tube nut with PWA 550 antigalling compound.

i. Connect gearbox drain manifold to adapter. Torque tube nut 65 to 75 pound-inches.

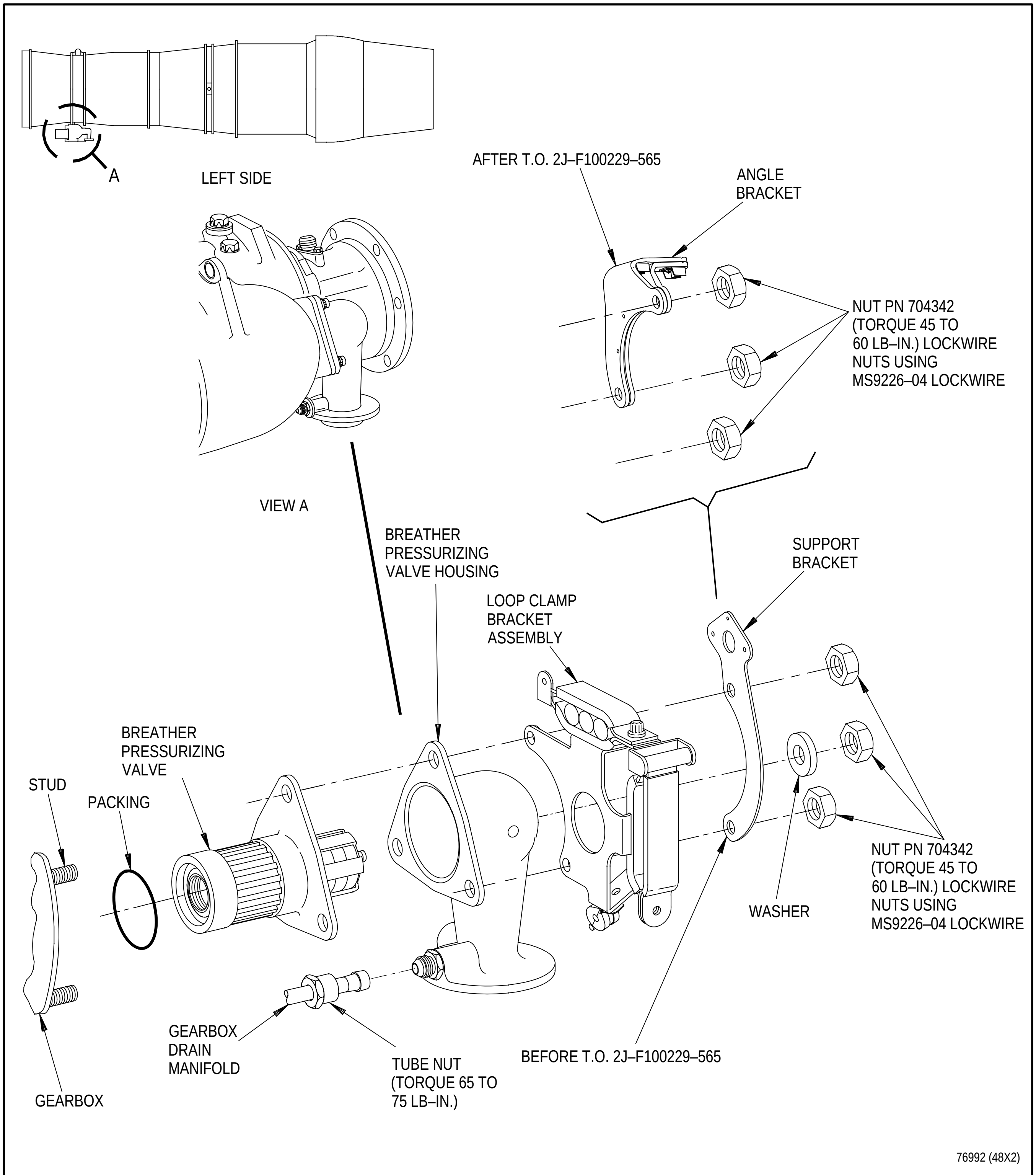


Figure 6. Breather Pressurizing Valve Assembly - Installation

WORK PACKAGE

TECHNICAL PROCEDURES

COOLER - OIL (FUEL)

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 10

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 9	0	10 Blank	0		

REFERENCE MATERIAL REQUIRED

None

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Cloth, clean dry lint-free	-
Compound, antigalling (PWA 550)	Hi-T-650 or Lubri-Bond HT
Crocus cloth	P-C-458
Lockwire (0.032 inch diameter)	MS9226-04
Oil, lubricating,	MIL-L-7808 or
Petrolatum, (alternate to oil)	VV-P-236
Solvent, petroleum	P-D-680, Type II

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Packing, preformed	MS9966-10	3
Packing, preformed	4069414	2

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures for the oil cooler (fuel):

- Removal
- Cleaning
- Inspection
- Installation

2. OIL COOLER (FUEL) - REMOVAL.
(See Figure 1.)

a. Place container under oil cooler.

b. Remove nuts securing fuel pressurizing and dump valve to oil cooler. (See figure 1.)

c. Remove bolts securing tube assembly to oil cooler. Discard packing.

d. Remove bolts securing oil cooler manifold to oil cooler. Discard packing.

e. Remove bolts securing cold start valve oil supply tube to oil cooler. Discard packing.

CAUTION

Do not allow foreign objects to enter oil cooler, tube, manifold, hose, or valve as damage to main oil pump may occur.

f. Support oil cooler and remove nut and shoulder bolt.

g. Carefully move oil cooler forward far enough to disengage it from pins of flange G.

h. Remove transfer tube from valve.

i. Discard preformed packings.

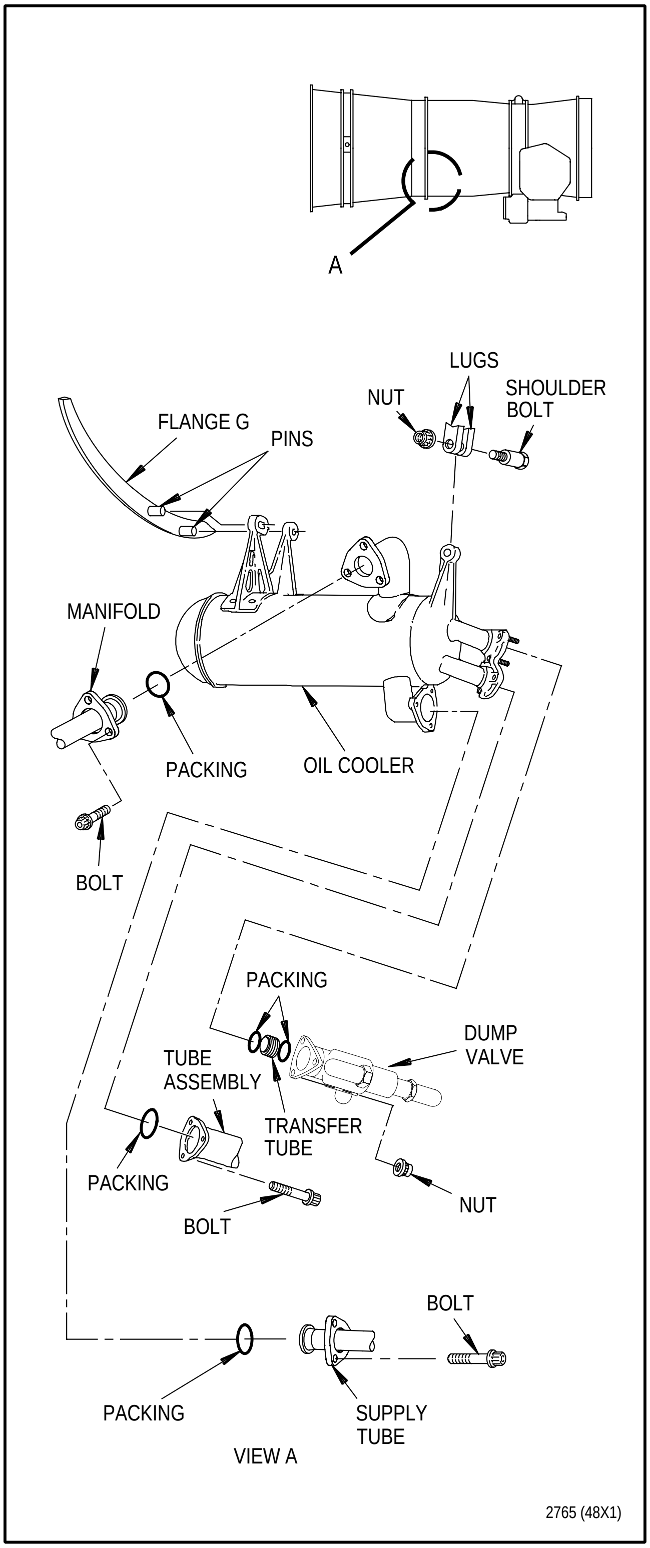


Figure 1. Oil Cooler (Fuel) Removal

3. OIL COOLER (FUEL) - CLEANING.

a. Using a clean cloth moistened with P-D-680, Type II petroleum solvent, wipe exterior of oil cooler.

b. Dry oil cooler with a clean, dry lint-free cloth.

4. OIL COOLER (FUEL) - INSPECTION.

a. Visually examine oil cooler for signs of leakage. Replace questionable oil coolers.

b. Visually examine all threaded holes for broken or dented threads. Replace oil cooler having damaged threads.

c. Visually examine sealing surfaces for pits, dents, or scratches. Replace oil cooler having damaged sealing surfaces.

d. Examine exterior surface of oil cooler for cracks. Replace cracked oil cooler.

e. Visually examine areas around mounting holes of oil cooler for cracks. Replace oil cooler having cracked mounting hole.

f. Visually examine exterior of oil cooler for dents. Round-bottom dents less than 0.025 inch deep are acceptable if no cracks are evident. Replace oil cooler having sharp edged dents with material removed.

g. Visually inspect exterior of oil cooler for scratches. Scratches less than 0.004 inch deep are acceptable if raised material can be removed by rubbing with a crocus cloth. Resulting finish shall blend with surrounding undamaged area.

5. OIL COOLER (FUEL) - INSTALLATION.
(See Figure 2.)

a. Lubricate three PN MS9966-10 and two PN 4069414 packings with a light coat of MIL-L-7808 oil or VV-P-236 petrolatum.

b. Install two PN MS9966-10 packings on transfer tube. Install transfer tube in fuel pressurizig and dump valve. (See figure 2, Sheet 1.)

c. Install PN MS9966-10 packing on tube assembly.

d. Install PN 4069414 packing on cold start valve oil supply tube.

e. Install PN 4069414 packing on oil cooler manifold.

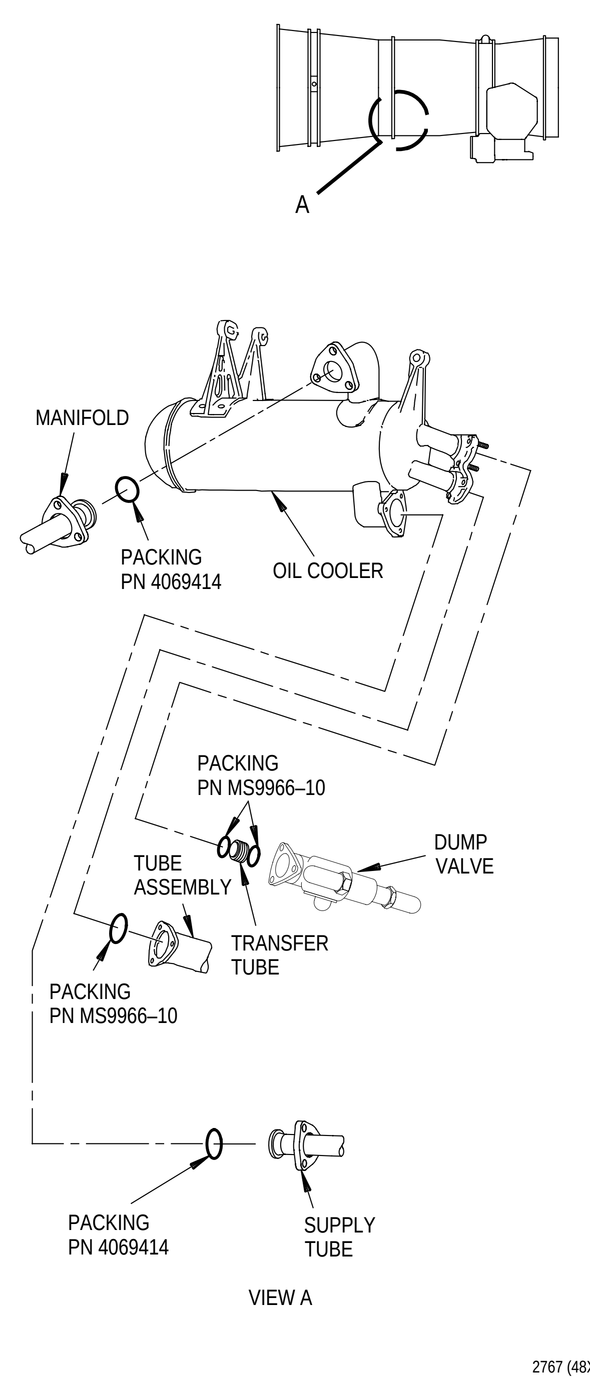


Figure 2. Oil Cooler (Fuel) - Installation (Sheet 1 of 4)

f. Ensure oil cooler mounting pins located on flange G are clean and smooth. Brush pins using a medium brass brush if necessary. (See figure 2, Sheet 2.)

g. Install oil cooler by:

(1) sliding mounting bracket holes onto pins

(2) aligning two lower oil cooler flanges with fuel pressurizing and dump valve and cold start valve oil supply tube

(3) aligning forward mount bracket and engine mounting lugs

h. Apply PWA 550 antigalling compound to threads of mounting bolt. Install bolt through engine mounting lugs and oil cooler mounting bracket.

i. Install nut and torque 27 to 30 pound-inches.

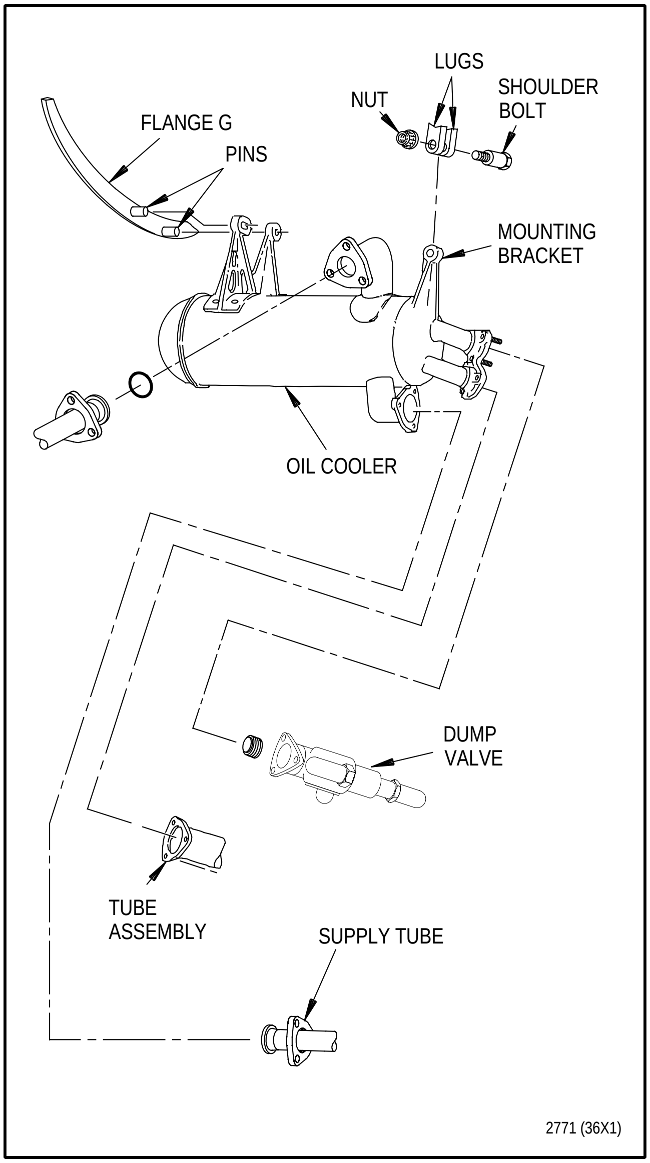


Figure 2. Oil Cooler (Fuel) - Installation (Sheet 2 of 4)

j. If oil cooler mounting bolt cannot be inserted, remove oil cooler and make the following adjustment: (See figure 2, sheet 3.)

(1) Loosen nuts enough to allow plate to be moved by hand. Position oil cooler in place. Refer to step g.

(2) Adjust plate so hole in mounting bracket aligns with holes in mounting lugs.

(3) Remove oil cooler and tighten nuts. Torque nuts 54 to 60 pound-inches.

(4) Install oil cooler. Refer to steps g., h., and i.

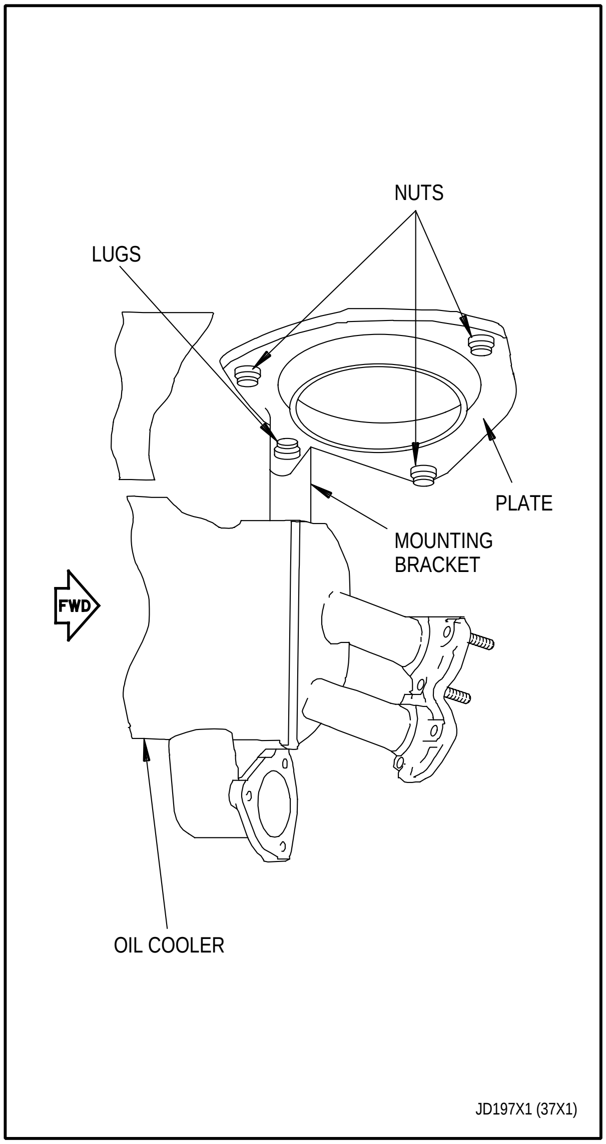


Figure 2. Oil Cooler (Fuel) - Installation (Sheet 3 of 4)

k. Apply a light coat of PWA 550 antigalling compound to threads of studs. Install nuts to secure fuel pressurizing and dump valve to oil cooler. Torque nuts 54 to 60 pound-inches. (See figure 2, sheet 4.)

NOTE

Air vent manifold shall be installed prior to oil cooler supply outlet tube.

l. Apply a light coat of PWA 550 antigalling compound to threads of three bolts and install to secure tube assembly to oil cooler. Torque bolts 62 to 72 pound-inches.

m. Apply a light coat of PWA 550 antigalling compound to threads of bolts and install to secure cold start valve oil supply tube to oil cooler. Torque bolts 62 to 72 pound-inches.

n. Apply a light coat of PWA 550 antigalling compound to threads of bolts and install to secure oil cooler manifold to oil cooler. Torque bolts 62 to 72 pound-inches.

o. Lockwire using MS9226-04 wire.

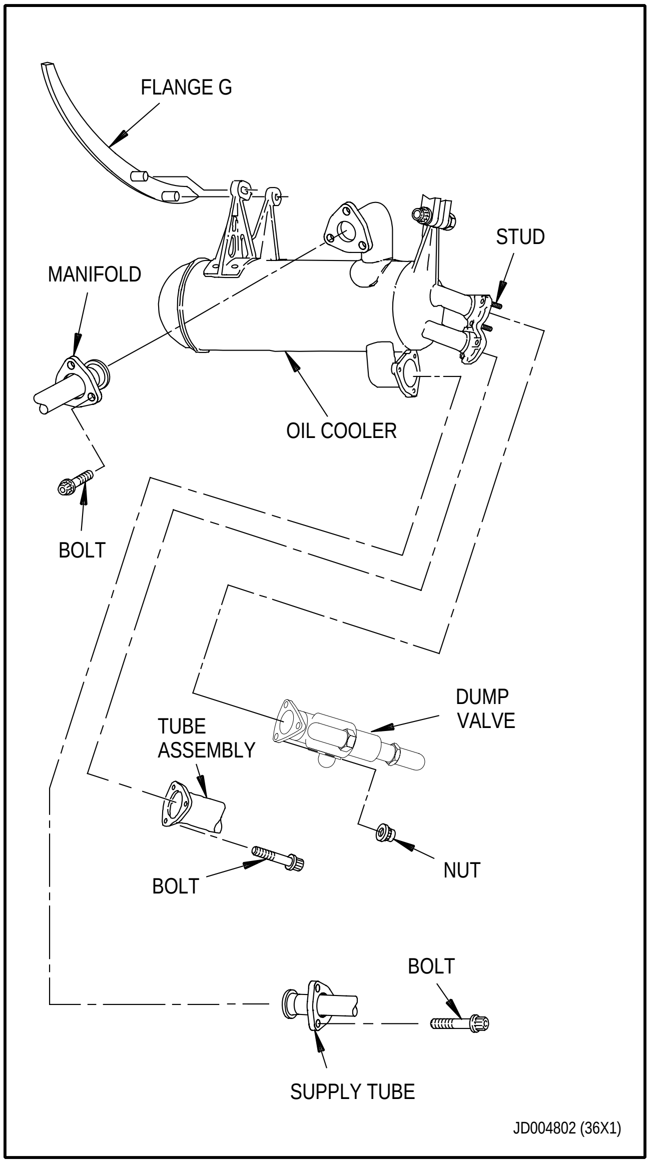


Figure 2. Oil Cooler (Fuel) - Installation (Sheet 4 of 4)

WORK PACKAGE

TECHNICAL PROCEDURES

TRANSMITTER - PRESSURE (OIL)

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 14

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2	30	3	30	8	30
2A Added	30	4 - 7	0	8A - 8B Added	30
2B Blank Added	30			9 - 10	0

REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information --------------	T.O. 2J-F100-53-1
General Procedures --------------------------	WP 021 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
ALCOHOL, DENATURED	O-E-760, TYPE III
CLOTH, DRY LINT-FREE	-
COMPOUND, ANTIGALLING (PWA 550)	HI-T-650 OR LUBRI-BOND HT
LOCKWIRE	MS9226-04 (0.032 INCH DIAMETER)
LUBRICANT, SEALING RING (PWA 36500)	ULTRACHEM ASSEMBLY FLUID, NO. 1
OIL, LUBRICATING	MIL-L-23699
OIL, LUBRICATING	MIL-L-7808
SOLVENT, PETROLEUM	P-D-680, TYPE II
TRICHLOROETHANE INHIBITED-1,1,1	O-T-620

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
PACKING, PREFORMED	ST1001-04	2

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
5A	PRESSURE TRANSMITTER (OIL) - PURGE OF AIR	
	FIXTURE, OIL PRESSURE, MAIN OIL PRESSURE TRANSMITTER -	PWA 56820

ILLUSTRATED SUPPORT EQUIPMENT

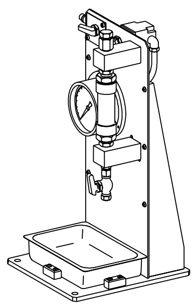


Figure T1. PWA 56820 FIXTURE

1. INTRODUCTION.

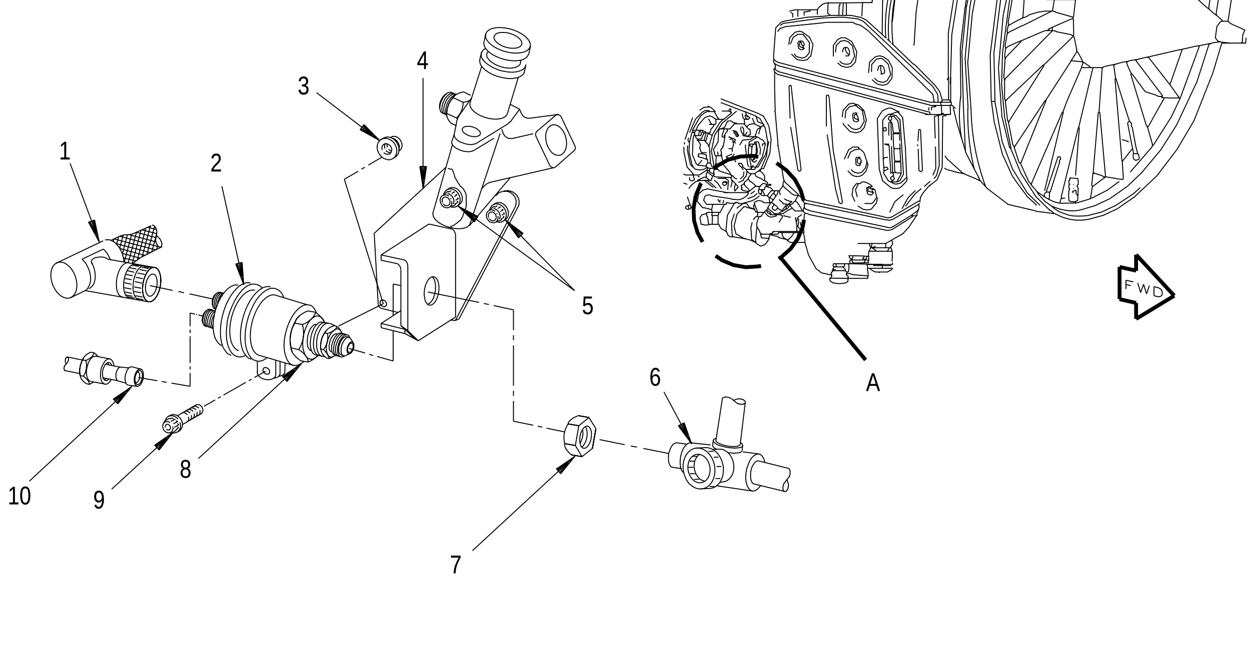
a. This work package contains instructions for the following maintenance procedures for pressure transmitter (oil):

- Removal
- Removal of attaching parts
- Cleaning
- Inspection
- Purge of air
- Installation of attaching parts
- Installation

2. PRESSURE TRANSMITTER (OIL) - REMOVAL.
(See Figure 1.)

a. Remove pressure transmitter. See figure 1.

a. PLACE CONTAINER UNDER OIL PRESSURE TRANSMITTER.
b. DISCONNECT ELECTRICAL CONNECTOR P8 (1) FROM PRESSURE TRANSMITTER (8).
c. DISCONNECT ANTISIPHON TUBE (10) AND OIL PRESSURE TUBE (6) FROM TRANSMITTER.
d. REMOVE NUT (3) AND BOLT (9) SECURING CLAMP (2) TO BRACKET (4).
e. LOOSEN BOLTS (5).
f. REMOVE JAMNUT (7) SECURING TRANSMITTER TO BRACKET (4). REMOVE TRANSMITTER.
g. INSTALL PROTECTIVE CLOSURES.



JD83X2 (30X2)

Figure 1. Pressure Transmitter (Oil) - Removal

3. PRESSURE TRANSMITTER (OIL) - REMOVAL OF ATTACHING PARTS.

(See Figure 2.)

a. Remove clamp from pressure transmitter. (See figure 2.)

b. Remove adapters and packings from pressure transmitter. Discard packings.

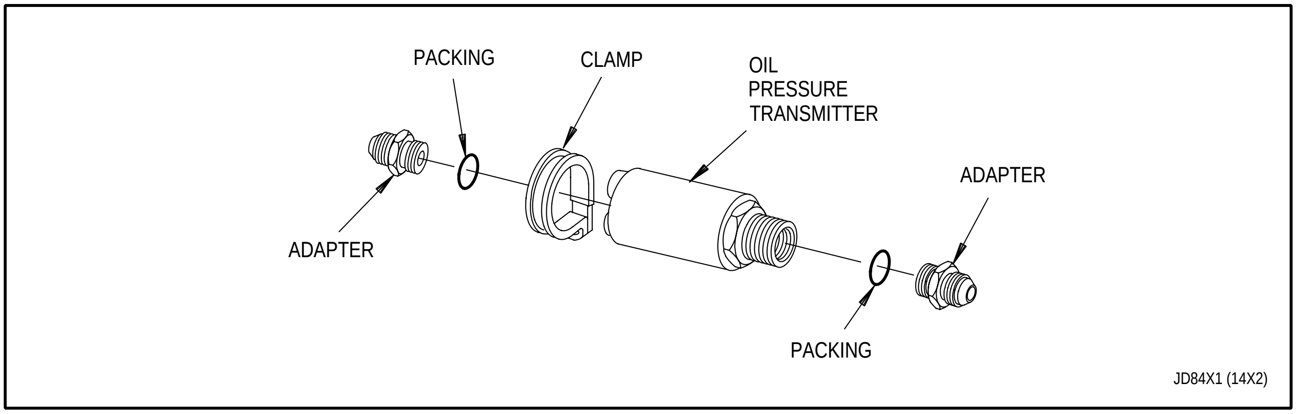


Figure 2. Pressure Transmitter (Oil) - Removal of Attaching Parts

4. PRESSURE TRANSMITTER (OIL) - CLEANING.

a. Using a clean cloth moistened with P-D-680, Type II, petroleum solvent, wipe exterior of pressure transmitter.

b. Wipe dry with a clean, dry lint-free cloth.

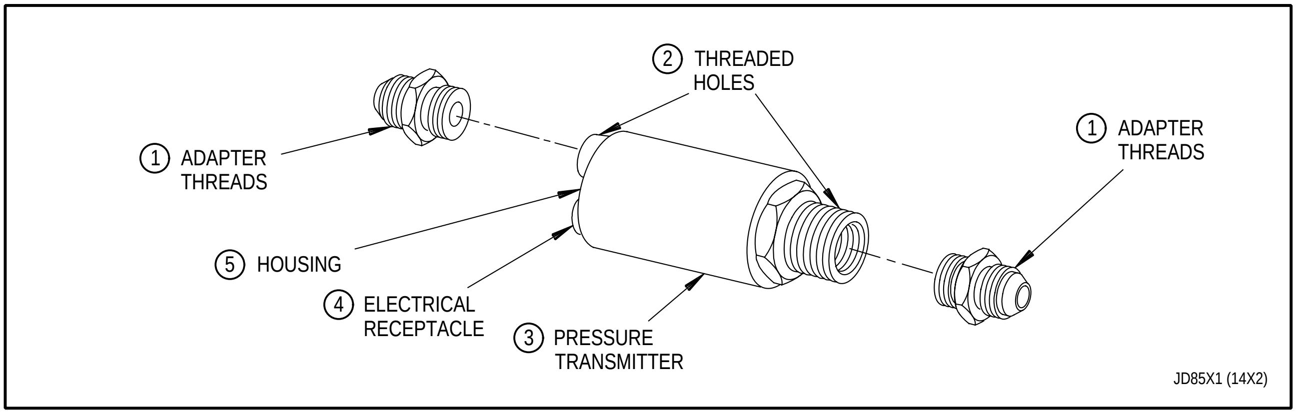
c. Wipe bracket with moistened cloth, especially where it will come in contact with transmitter. Wipe dry with a clean, dry lint-free cloth.

d. Clean electrical cable connector P8 pins, transmitter receptacle and cable insulation with O-E-760, Type III, denatured alcohol, or Trichloroethane inhibitor-1,1,1 O-T-620. Dry connector and receptacle with clean, compressed air at less than 30 psig.

5. PRESSURE TRANSMITTER (OIL) - INSPECTION.
(See Figure 3.)

a. Visually inspect transmitter. (See figure 3.)

b. Inspect electrical connector. Refer to T.O. 2J-F100-53-1, WP 021 00.



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Adapter threads -			
Broken, dents, or nicked	Not serviceable	Not reparable	Replace adapter.
2. Threaded holes -			
Broken, dented, or nicked threads	Not serviceable	Not reparable	Replace pressure transmitter.

Figure 3. Pressure Transmitter (Oil) - Inspection

Legend for figure 3 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
3. Pressure transmitter -			
Dented orcracked	Not serviceable	Not reparable	Replace pressure transmitter.
4. Electrical receptacle -			
Threads, stripped crossed, missing	Not serviceable	Not reparable	Replace pressure transmitter.
5. Housing -			
Dented or cracked	Not serviceable	Not reparable	Replace pressure transmitter.

5A. PRESSURE TRANSMITTER (OIL) - PURGE OF AIR.

(See Figure 3A.)

a. Support PWA 56820 fixture(1) on table or bench.

b. Remove plug(2) and fill sight flow indicator(3) with MIL-L-7808 or MIL-L-23699 lubricant. Fill midway between MIN and MAX on indicator.

c. Install oil pressure transmitter(4) on fixture adapter(5) below sight flow indicator(3).

d. Set valve(6) at upper left side of fixture to OFF position.

e. Connect shop air hose to quick disconnect coupling(7).

f. Set valve(6) to PRESSURE position.

g. Adjust regulator(8) so pressure reading on pressure gauge(9) is 40 to 50 psig.

h. Open valve(10) between sight flow indicator(3) and oil pressure transmitter(4) for approximately 10 seconds. Close valve(10).

i. Observe sight flow indicator(3) for bubbles. Repeat steps h. and i. until no air bubbles show in sight flow indicator.

j. Remove oil pressure transmitter(4) and cap fixture adapter(5).

k. Set valve(6) to OFF position.

l. Disconnect shop air hose from quick disconnect coupling(7).

m. Set valve(6) to VENT position.

Legend for figure 3A

1. Fixture
2. Plug
3. Sight flow indicator
4. Oil pressure transmitter
5. Fixture adapter
6. Valve
7. Quick disconnect coupling
8. Regulator
9. Pressure gauge
10. Valve

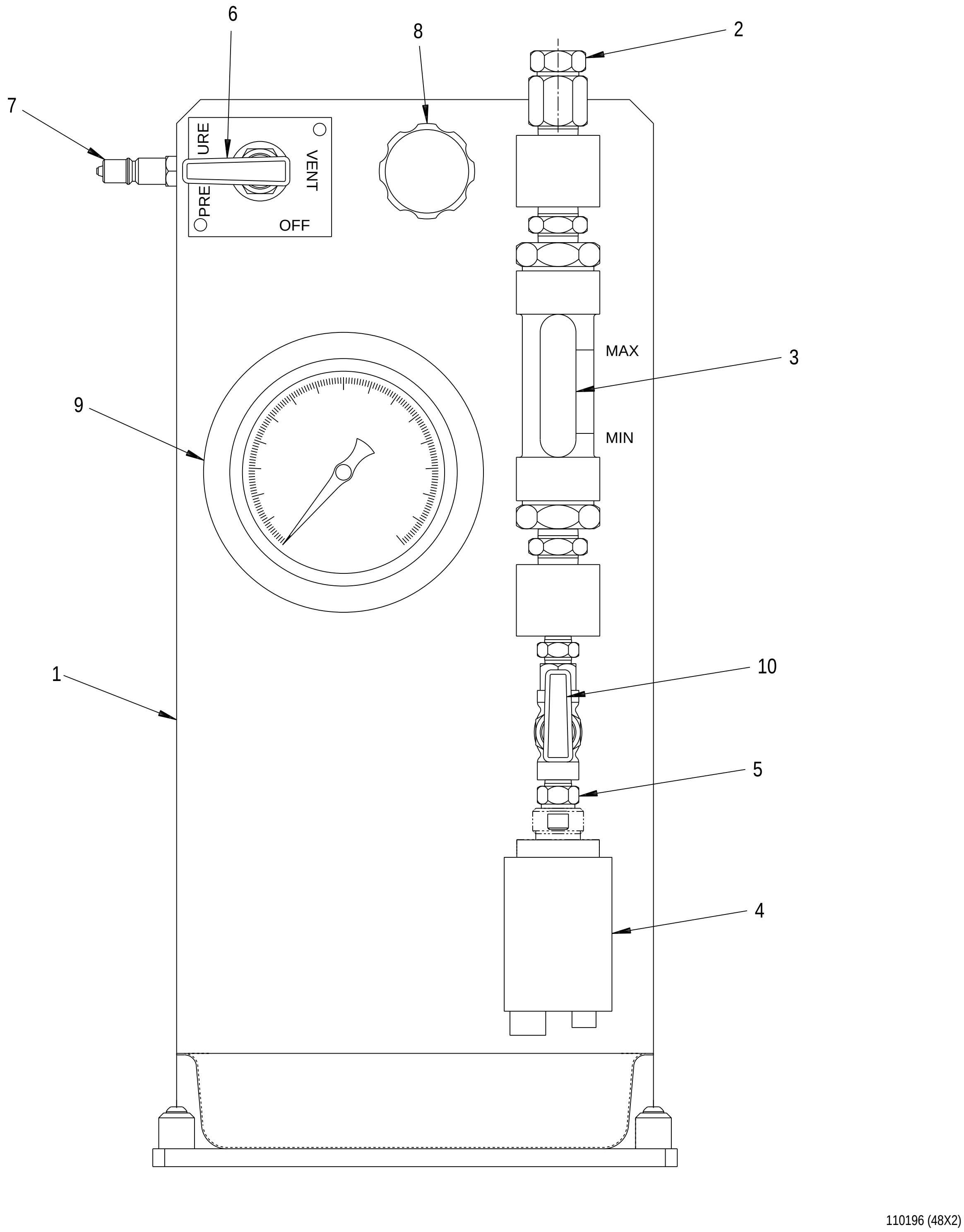


Figure 3A. Pressure Transmitter - Purge of Air

6. PRESSURE TRANSMITTER (OIL) - INSTALLATION OF ATTACHING PARTS.
(See Figure 4.)

a. Lubricate two PN ST1001-04 packings and threads of both adapters with a light coat of MIL-L-7808 oil or PWA 36500 sealing ring lubricant. Remove protective plugs from antisiphon and oil pressure tube ports on pressure transmitter.

b. Install adapters in ports of transmitter. Torque adapters 90 to 100 pound-inches. Place protective closures on adapters.

c. Slide clamp onto transmitter.

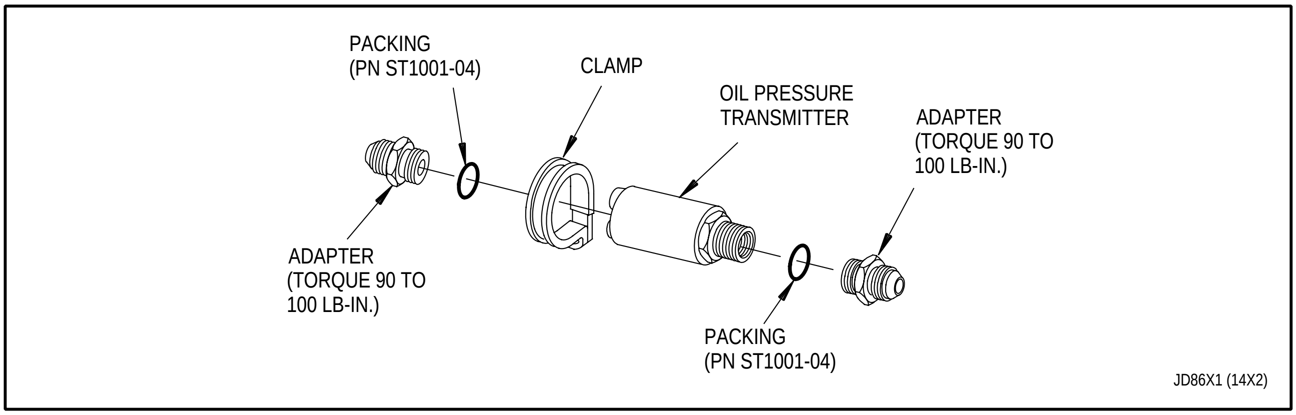


Figure 4. Pressure Transmitter (Oil) - Installation of Attaching Parts

7. PRESSURE TRANSMITTER (OIL) - INSTALLATION.
(See Figure 5.)

a. Put a light coat of PWA 550 antigalling compound on threads of jamnut. Remove excess.

b. Position transmitter on bracket so electrical connector is in 3 o'clock position and front adapter extends through bracket. Install jamnut handtight.

c. Put a light coat of MIL-L-7808 oil on threads of oil pressure tube and antisiphon tube coupling nuts. Remove protective closures from adapters on transmitter and remove protective plugs from tubes.

d. Connect oil pressure and antisiphon tubes to transmitter. Torque tube coupling nuts 90 to 100 pound-inches.

e. Put a light coat of PWA 550 antigalling compound on clamp bolt. Position clamp against bracket and install bolt and nut. Tighten nut fingertight.

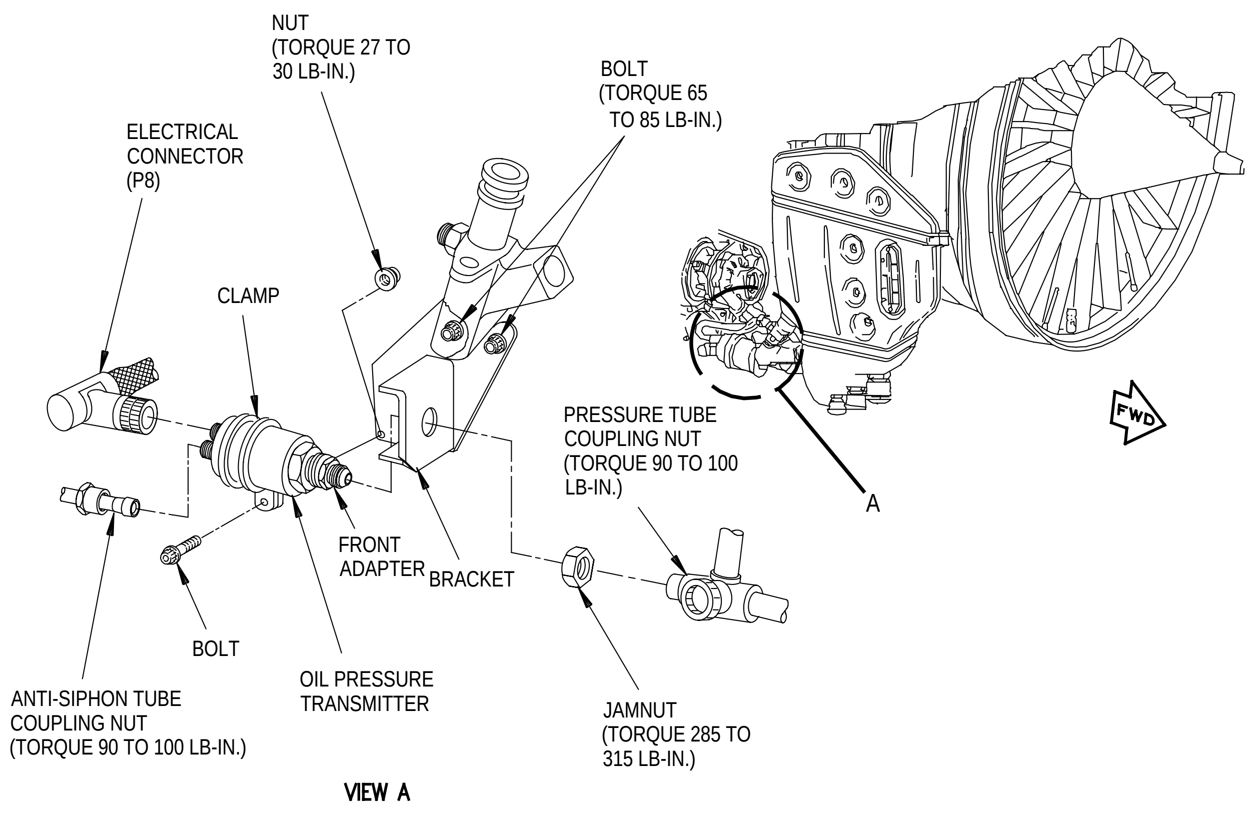


Figure 5. Pressure Transmitter (Oil) - Installation

f. Loosen bolts holding bracket to gearbox. Brace pressure transmitter in its aligned position. Tighten and torque jamnut 285 to 315 pound-inches. Lockwire jamnut with PN MS9226-04 wire.

g. Tighten and torque bolts holding bracket to engine 65 to 85 pound-inches. Lockwire bolts with PN MS9226-04 wire.

h. Tighten and torque nut holding clamp to bracket 27 to 30 pound-inches.

i. Remove protective closures from electrical connector P8 and receptacle on transmitter receptacle. Connect electrical connector to transmitter by pushing cable connector into receptacle and turning knurled ring clockwise until it snaps into place.

WORK PACKAGE

TECHNICAL PROCEDURES

FILTER - OIL

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 24

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	28	7	28	10D Blank Added	28
2	14	8	16	11 - 12	3
3	28	9	14	13 - 14	14
4	3	10	28	15	28
5	28	10A - 10C Added	28	16	14
6	4			17 - 20	3

REFERENCE MATERIAL REQUIRED

None

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

T. O. No.	Date	Level	Title (ECP No.)
T.O.2J-F100229(V)-501	1 Jan 95	O/I	Incorporation of 30 Micron Oil Filter With Full-Flow Bypass Valve, F100-PW-229 Engine, F15/F-16 Aircraft (ECP 90QA167C1)

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Compound, antigalling, (PWA 550)	Hi-T-650 or Lubri-Bond HT
Container, plastic, or equivalent	-
Lockwire (0.032 inch diameter)	MS9226-04
Oil, lubricating	MIL-L-7808 or
Petrolatum	VV-P-236
Solvent, petroleum	P-D-680, Type II or Type III

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Packing, preformed	ST1000-214	2
Packing, preformed	MS9967-133	2
Packing, preformed	MS9967-225	1
Packing, preformed	M83248-1-014	1
Packing, preformed	M83248-1-015	1
Packing, preformed	M83248/1-016	1
Packing, preformed	M83248/1-023	3
Packing, preformed	M83248/1-144	1
Packing, preformed	4069414	2
Retaining ring	AA-9500-D344	1
Backup ring	MS28774-016	1

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
3A	OIL FILTER - TORQUING LOOSE COMPONENTS IN FILTER HEAD ASSEMBLY	
	ADAPTER, TORQUE, OIL FILTER SHUTOFF VALVE -------	PWA 56801

ILLUSTRATED SUPPORT EQUIPMENT

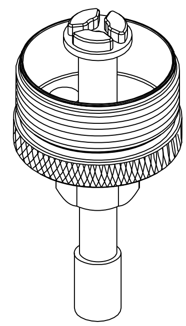


Figure T1. PWA 56801 ADAPTER

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures for oil filter:

- Filter element - Replacement
- Removal
- Removal of attaching parts
- Disassembly
- Cleaning
- Oil filter head and bowl - Inspection
- Oil filter impending and actual bypass indicators - Inspection
- Oil filter head and bowl - Repair
- Assembly
- Installation of attaching parts
- Installation

NOTE

Engines may have either of two types of oil filter assemblies installed: one contains a 70 micron cleanable element, the other contains a 30 micron disposable filter element and a bypass valve with an actual bypass indicator in the filter bowl bottom.

b. Filter element may be replaced with oil filter installed on engine. Refer to paragraphs 2 and 3.

2. 70-MICRON FILTER ELEMENT (PN AD-9348-1657 FILTER) - REPLACEMENT.
(See Figure 1.)

WARNING

- Oil filter bowl is full of oil. Use care when removing filter bowl. Shutoff valves in filter head will prevent further draining of oil system.
- Filter bowl is under spring tension. Use caution when removing filter bowl to prevent personal injury.

NOTE

If differential pressure indicator is extended, filter may be contaminated and require replacement.

a. Unscrew filter bowl from filter head. Pour oil from bowl into a container.

b. Remove and discard existing filter element and packings from bowl.

b1. Visually inspect filter head internal components for looseness. If loose, torque per paragraph 3A.

c. Lubricate replacement packings and threads of filter bowl with a light coat of MIL-L-7808 oil.

d. Install M83248/1-023 packing on top of filter element. Place PN AA-9348E-165 filter element in filter bowl. Place M83248/1-144 packing on edge of filter bowl.

e. Do not exceed 300 pound-inches to obtain proper clearance between filter head and filter bowl.

CAUTION

An 0.030 inch clearance between oil filter body and oil filter bowl shall be maintained to ensure that oil flow shut-off valve in oil filter body is opened.

f. Install filter bowl and element on head. Tighten filter bowl until clearance between mating shoulders of filter head and bowl is 0.000 to 0.030 inch. (See figure 1.)

g. Lockwire filter bowl with PN MS9226-04 wire.

h. Reset differential pressure indicator by pushing in red button. If button does not remain depressed, replace indicator.

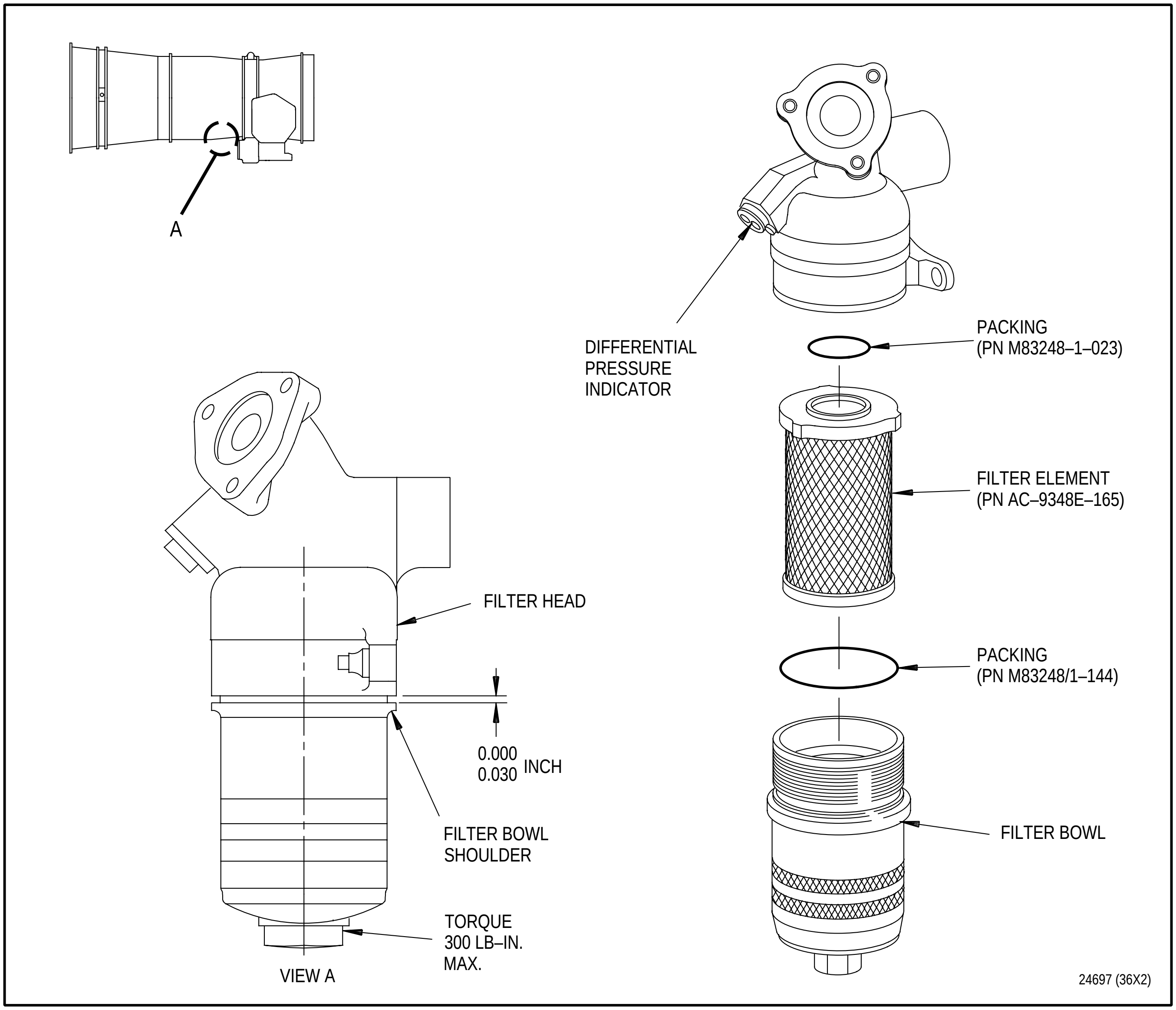


Figure 1. 70-Micron Filter Element (PN AD-9348-1657 Filter) - Replacement

3. 30-MICRON FILTER ELEMENT (PN AD-9348-1657Y1 FILTER) - REPLACEMENT.

(See Figure 2.)

WARNING

- Oil filter bowl is full of oil which could be hot and under pressure. Use care when removing filter bowl. Shutoff valves in filter head will prevent further draining of oil system.
- Filter bowl is under spring tension. Use caution when removing filter bowl to prevent personal injury.

NOTE

If actual bypass indicator on bowl is extended, filter may be contaminated and require replacement.

a. Unscrew filter bowl from filter head. Pour oil from bowl into a container.

b. Remove filter element and bypass valve from bowl. Discard packings on filter bowl, on top of element and on top of bypass valve.

b1. Visually inspect filter head internal components for looseness. If loose, torque per paragraph 3A.

c. Lubricate all packings and threads of filter bowl with a light coat of MIL-L-7808 oil.

d. Install M83248/1-144(1) in filter bowl groove and lubricate threads of filter bowl.

e. Install M83248/1-023(2) preformed packings in filter element.

f. Install M83248/1-023(3) packing in groove of bypass valve assembly.

g. Install element bypass valve on filter element and place filter element in bowl.

CAUTION

- Failure to maintain proper clearance between oil filter body and oil filter bowl may result in improper position of oil flow shut-off valve.
- Overtorquing filter bowl may cause damage to filter head or filter bowl.

h. Install filter bowl and element on head. Tighten filter bowl until clearance between mating shoulders of filter head and bowl is 0.000 to 0.030 inch. (See figure 2.)

i. Lockwire filter bowl with PN MS9226-04 wire.

j. Reset impending bypass indicator and actual bypass indicators by pushing in red buttons. For actual bypass indicator (see figure 2) oil filter bowl must be removed and inverted to reset button. If either button does not remain depressed, replace suspect indicator.

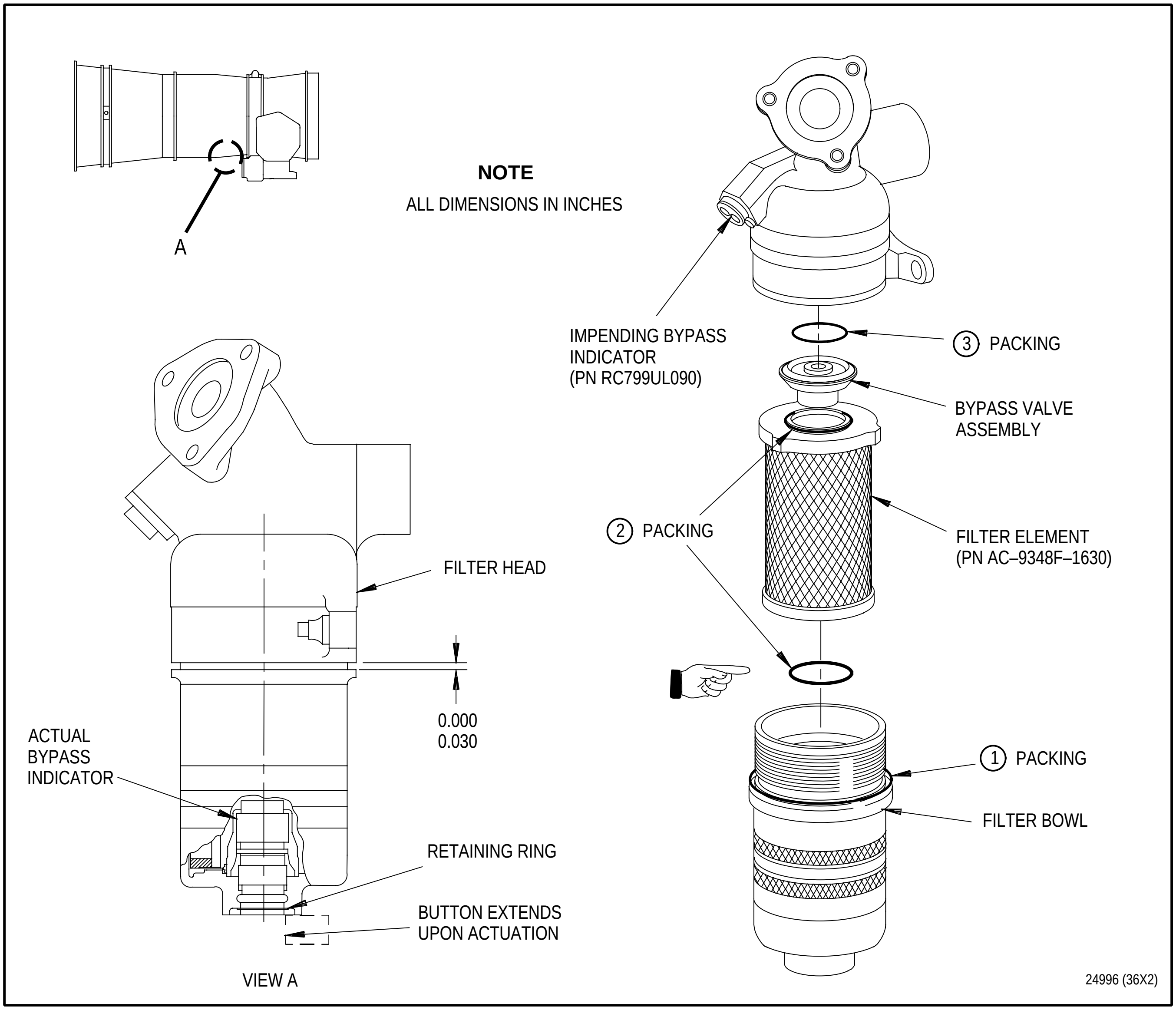


Figure 2. 30-Micron Filter Element (PN AD-9348-1657Y1 Filter) - Replacement

3A. OIL FILTER - TORQUING LOOSE COMPONENTS IN FILTER HEAD ASSEMBLY. (See Figure 2A.)

CAUTION

Differential pressure indicator consists of matched and permanently assembled details. Attempting disassembly may damage indicator.

a. Remove differential pressure indicator(7) as follows:

(1) Remove screws(8) securing indicator(7) to filter head(1). Remove indicator(7).

(2) Remove retainer(5) and spring(6). Remove and discard packings(3 and 4).

(3) Place indicator(7) in clean plastic container.

b. Loosen recessed lock screw(2) sufficiently to unlock nipple(16).

c. Thread PWA 56801 torque adapter into filter housing until bottomed, then thread 1/2 turn more to relieve pressure of springs(11 and 12) on nipple and shutoff diaphragm(13).

d. Push and rotate tool shaft(19) to engage cloverleaf assembly(18) in nipple(16).

WARNING

Nipple is spring loaded. Failure to maintain pressure during removal may cause components to spring out, causing personal injury and damage to components.

e. Holding inward hand pressure on tool, slowly turn socket(20) counterclockwise to remove nipple(16) and associated components.

f. Replace packings(9 and 17).

g. Assemble filter head(1) as follows:

(1) Press fit shutoff spring(11) into spring retainer(10) if required.

(2) Press nipple(16) into shutoff diaphragm(13).

(3) Fill hole in poppet(14) with clean lubricating oil.

(4) Insert poppet stem(15) into poppet(14) and insert both into nipple(16).

(5) Lubricate threads on nipple(16) with clean lubricating oil.

(6) Place assembled shutoff diaphragm(13) over spring(12).

(7) Place all components on PWA 56801 torque adapter, engaging cloverleaf assembly(18) in nipple(16).

(8) Push assembled adapter into filter head(1) until threads engage housing.

(9) Thread until bottomed, then back off 1/4 to 1/2 turn.

h. Torque to 180 inch-pounds.

i. Remove torque adapter.

j. Tighten recessed lock screw(2) and torque 12 to 16 inch-pounds.

k. Install differential pressure indicator(7) per paragraph 12 or 13.

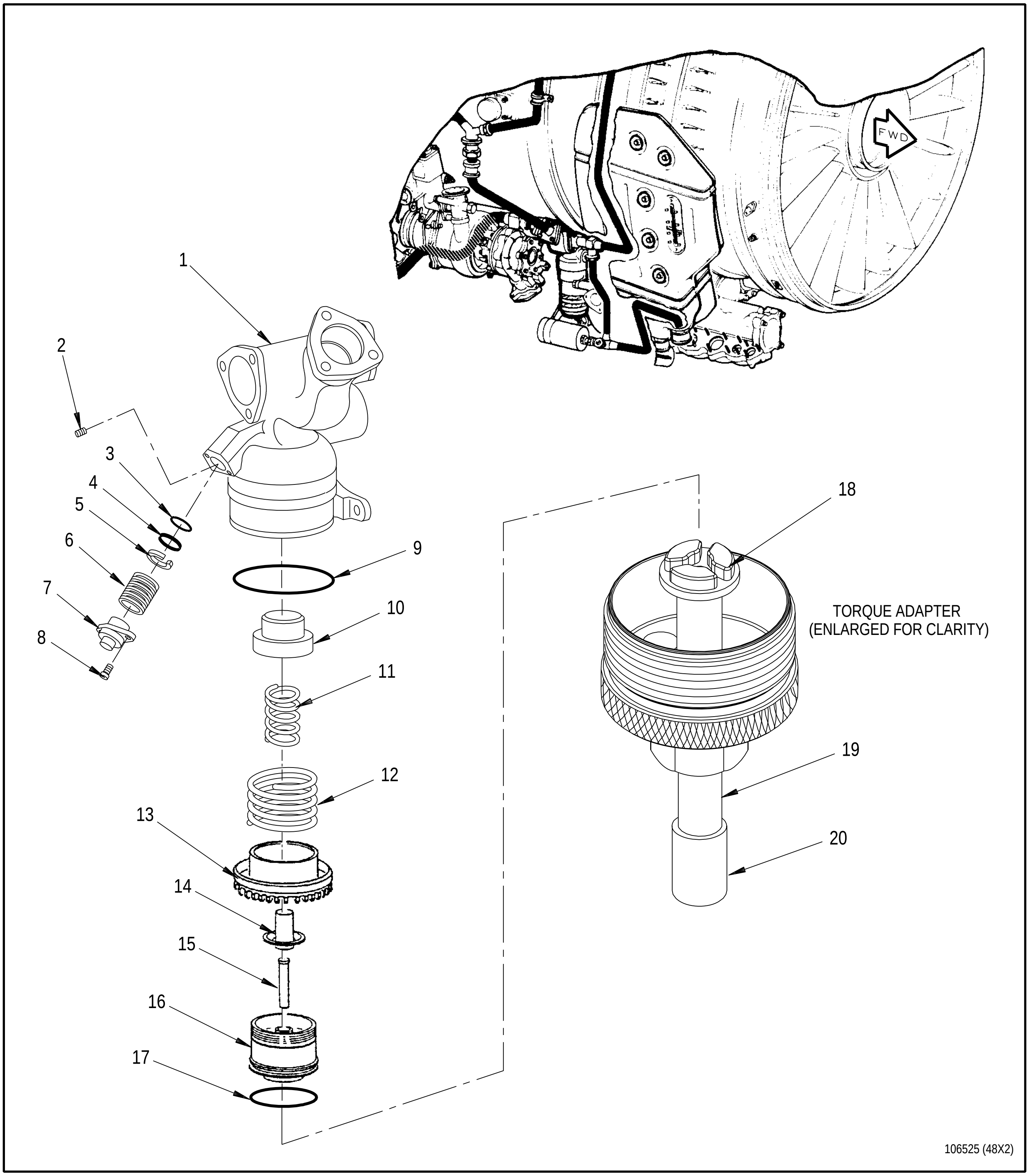


Figure 2A. Oil Filter - Torquing Loose Components in Filter Head Assembly

Legend for figure 2A

1. Filter head
2. Recessed lock screw
3. Packing
4. Packing
5. Retainer
6. Spring
7. Differential pressure indicator
8. Screw
9. Packing
10. Spring retainer
11. Shutoff spring
12. Spring
13. Shutoff diaphragm
14. Poppet
15. Poppet stem
16. Nipple
17. Packing
18. Cloverleaf assembly
19. Shaft
20. Socket

4. OIL FILTER - REMOVAL.
(See Figure 3.)

a. Place a bucket under augmentor fuel pump control to catch fuel, as elbow and tubes are disconnected.

b. Remove bolts and nuts securing augmentor fuel pump PF1 front tube to augmentor fuel pump and augmentor fuel pump PF1 rear tube. (See figure 3, Sheet 1.)

c. Remove augmentor fuel pump front tube and discard packing.

d. Install protective closure on augmentor fuel pump.

e. Remove bolts and nuts securing augmentor fuel pump PF1 tube elbow to main gear fuel pump.

f. Remove augmentor fuel pump tube elbow and augmentor fuel pump rear tube. Discard packing.

g. Install protective closure on main fuel gear pump.

h. Use a container to catch oil left in fuel oil cooler oil supply manifold.

i. Disconnect oil supply damper bearing tube from fuel oil cooler oil supply manifold. (See figure 3, Sheet 2.) Install protective closures.

j. Remove bolts and nuts securing fuel oil cooler supply manifold to oil filter bypass valve and oil filter.

k. Disengage outer section of block clamp by loosening nuts.

l. Remove fuel oil cooler supply manifold and discard packings.

m. Install protective closures on oil filter bypass valve and oil filter housing.

n. Remove nuts and washers securing oil filter to gearbox studs. Remove oil filter and transfer tube from gearbox. Install protective closure on gearbox.

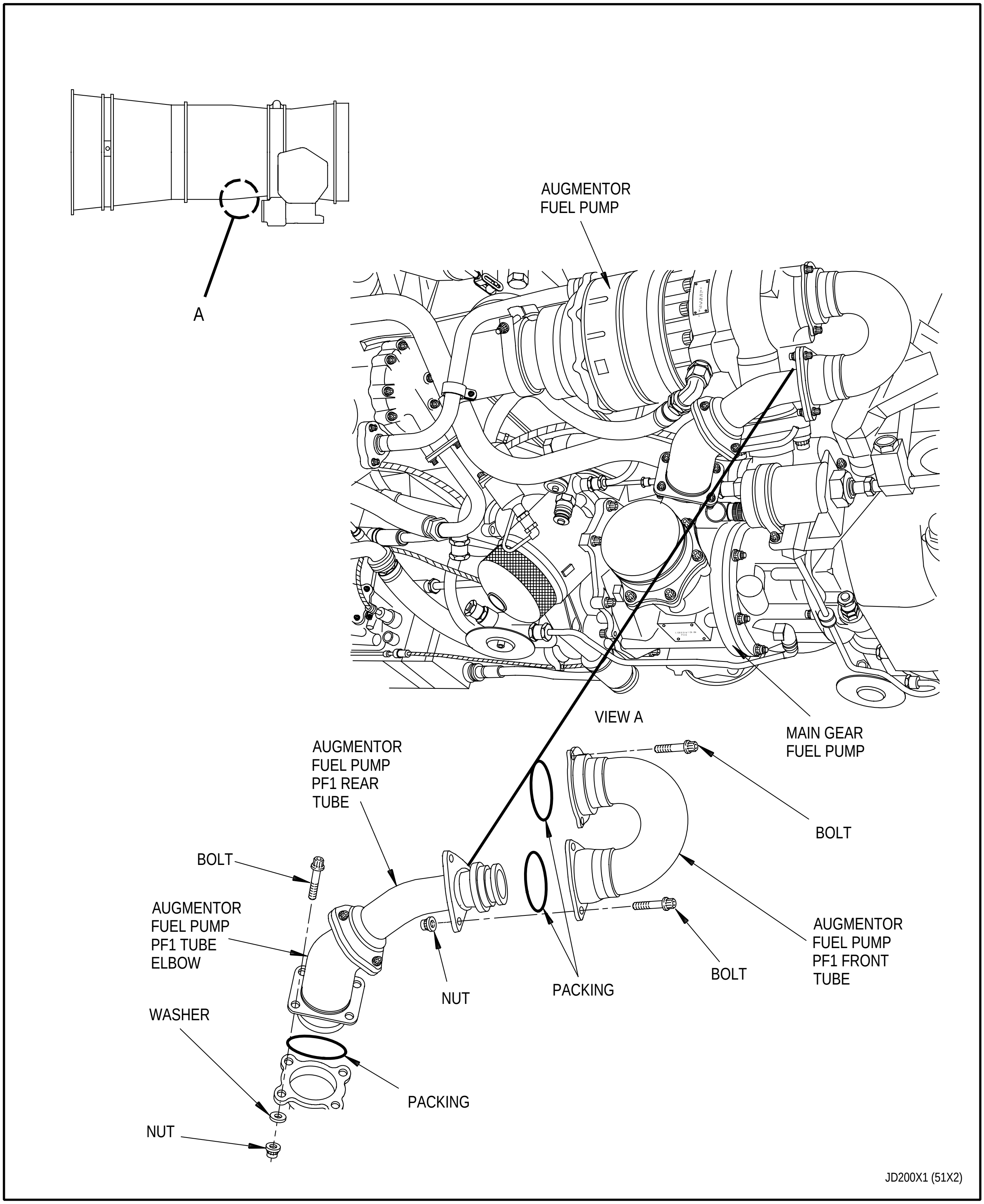


Figure 3. Oil Filter - Removal (Sheet 1 of 2)

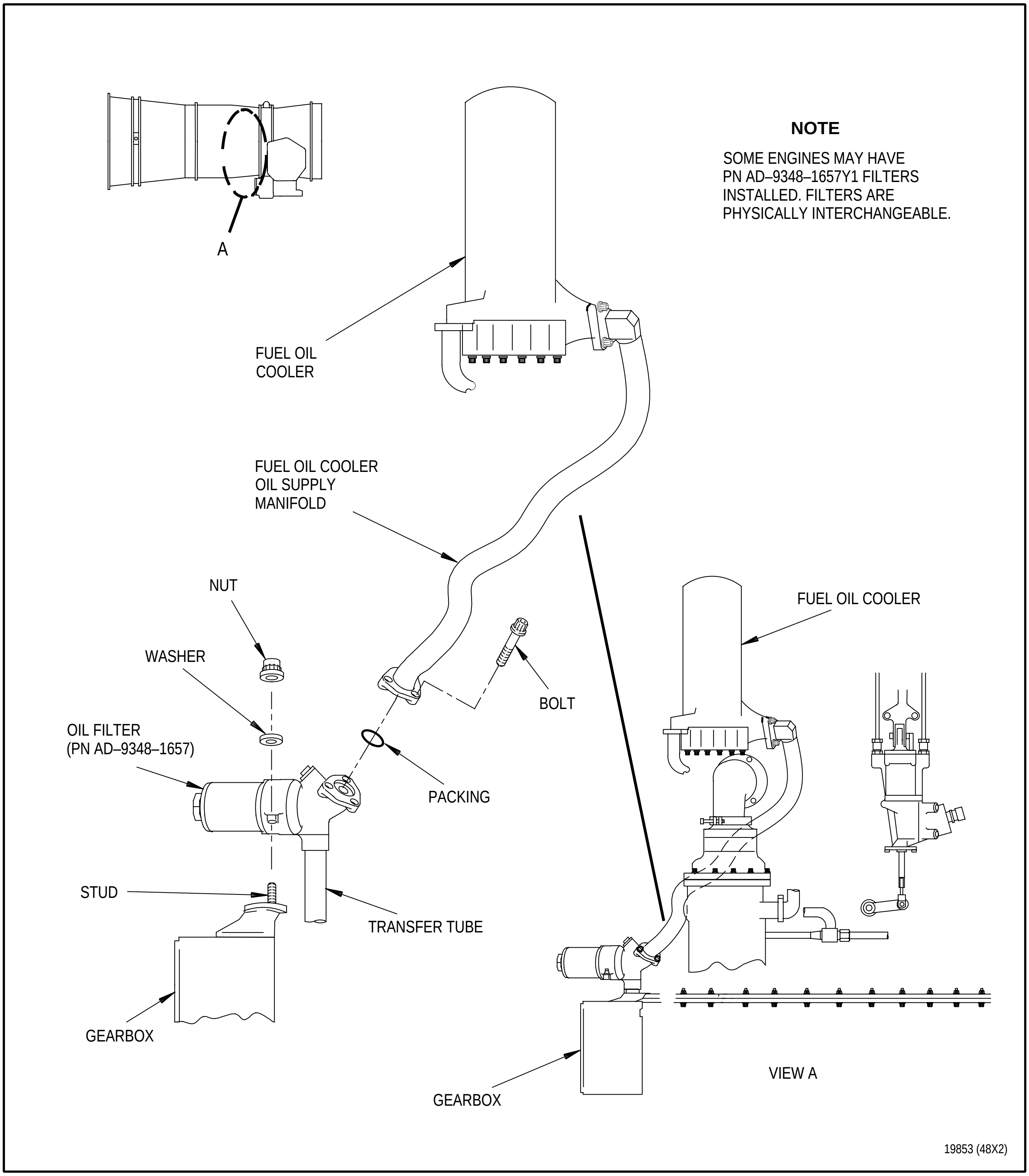


Figure 3. Oil Filter - Removal (Sheet 2 of 2)

5. OIL FILTER - REMOVAL OF ATTACHING PARTS.
(See Figure 4.)

a. Separate transfer tube from oil filter. Remove packing from both ends of transfer tube. Discard packings.

b. Install protective closures in transfer tube and oil filter.

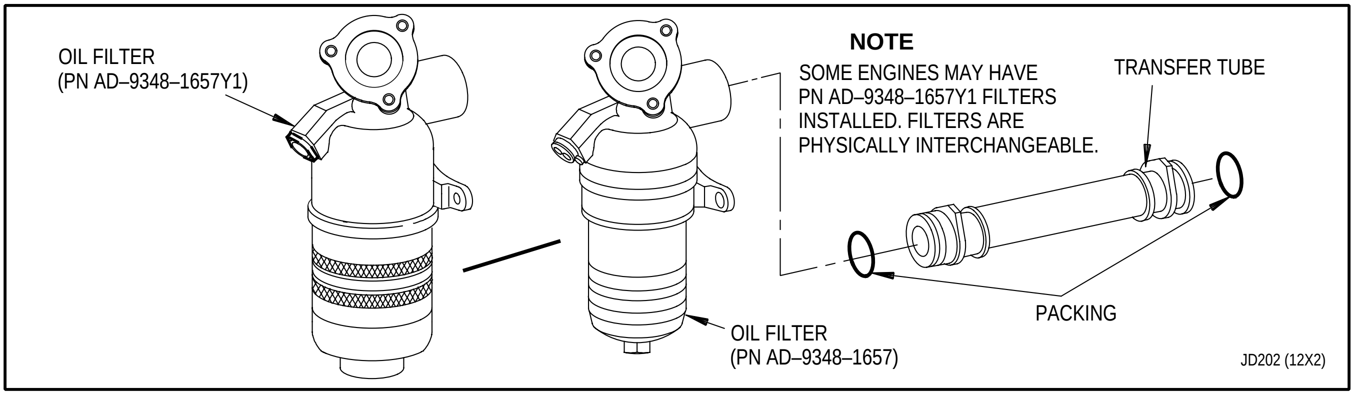


Figure 4. Oil Filter - Removal of Attaching Parts

6. OIL FILTER - DISASSEMBLY.
(See Figure 5.)

a. Remove filter element. Refer to paragraphs 2 and 3.

b. Remove packing from filter bowl.

c. Remove impending bypass indicator per figure 5 and as follows:

(1) Remove screws holding indicator in filter head. Remove indicator, spring, packings and retainer.

(2) Discard packings and retainer.

(3) Store indicator in a clean plastic bag.

d. For filter with 30-micron element, remove actual bypass indicator(2) as follows:

(1) Remove retaining ring(4) and actual bypass indicator(2) from filter bowl.

(2) Remove packings(1) and backup ring(3) from indicator. Discard packings and backup ring.

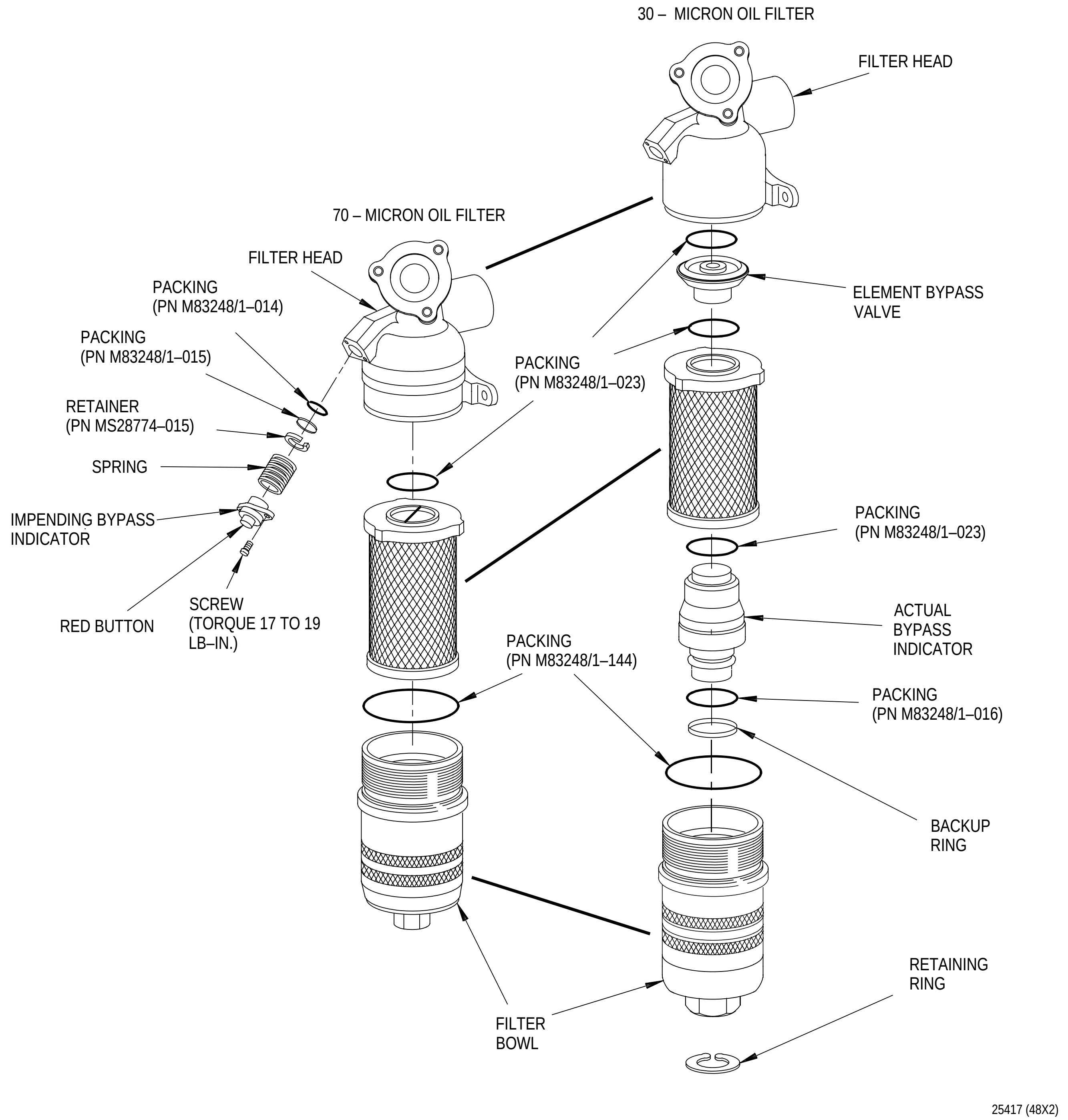


Figure 5. Oil Filter - Disassembly/Assembly

7. OIL FILTER BOWL - CLEANING.

a. Wash filter bowl with P-D-680 petroleum solvent.

b. Dry filter bowl with filtered compressed air at less than 30 psig.

8. OIL FILTER HEAD AND BOWL - INSPECTION.

a. Inspect threads for damage. Thread surface shall be smooth and free from nicks, dents, and burrs. Replace oil filter bowl or head having broken threads or indications of extreme roughness.

b. Cracks in filter head and filter bowl are not reparable and not acceptable. Replace cracked filter head or bowl.

c. Small nicks or scratches may be repaired. Refer to paragraph 10.

d. Mating surfaces are to be inspected for pickup, scoring, and high metal spots. Repair as necessary. Refer to paragraph 10.

e. Visually inspect filter head internal components for looseness. If loose, torque per paragraph 3A.

9. OIL FILTER IMPENDING AND ACTUAL BYPASS INDICATORS - INSPECTION.

NOTE

Impending bypass indicator shall be stored in clean plastic container before and after inspection.

a. Visually inspect indicators for damage. Replace indicators if damaged.

b. Check that red button of indicator is depressed. If it is not, press it in. Red button should remain depressed. Replace indicator if button does not remain depressed.

10. OIL FILTER HEAD AND BOWL - REPAIR.

a. Remove minor nicks, dents, and burrs from threads by finish tapping or light stoning.

b. Blend small nicks and scratches smooth but no deeper than 0.025 inch after blending for filter head assembly and no deeper than 0.012 inch for filter bowl.

c. Remove mating surfaces pickup, scoring, and high metal spots by blending or light stoning. Rework should remove raised material and sharp edges only.

11. OIL FILTER - ASSEMBLY.
(See figure 5.)

a. Install PN M83248/1-144 packing in filter bowl groove.

b. Install filter element. Refer to paragraphs 2 and 3.

c. Install impending bypass indicator as follows:

(1) Lubricate PN M83248-1-014 and PN M83248-1-015 packings, PN AA-990100-015 retainer, and indicator screws with a light coat of MIL-L-7808 oil.

(2) Install indicator, spring, retainer, and packings in filter head and fasten in place with indicator screws. Torque screws 17 to 19 pound-inches. Lockwire screws with PN MS9226-04 wire.

(3) Ensure red button of indicator is depressed. If button does not remain depressed, replace indicator.

d. For filter with 30-micron element, install actual bypass indicator as follows:

(1) Install PN M83248/1-016 preformed packing and backup ring on actual bypass indicator.

(2) Lubricate indicator cavity in filter bowl with clean lubricating oil.

(3) Install actual bypass indicator from inside bowl and secure with retaining ring.

12. OIL FILTER - INSTALLATION OF ATTACHING PARTS.
(See Figure 6.)

a. Lubricate two PN ST1000-214 packings with a light coat of MIL-L-7808 oil or VV-P-236 petrolatum. Remove protective closures from transfer tube and oil filter housing. Install packing on each end of transfer tube. Insert one end of transfer tube in port on forward side of filter.

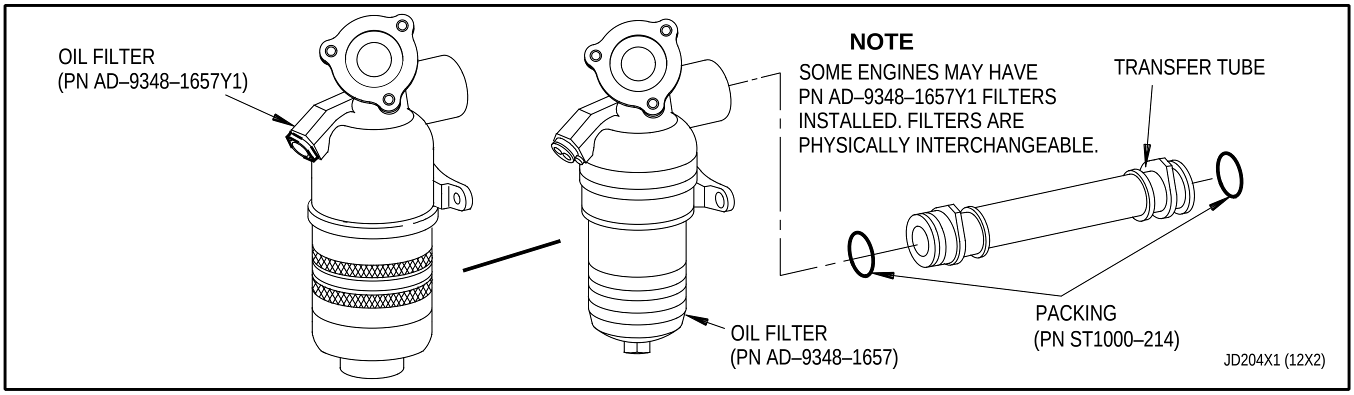


Figure 6. Oil Filter - Installation of Attaching Parts

13. OIL FILTER - INSTALLATION.
(See Figure 7.)

a. Put a light coat of PWA 550 antigalling compound on threads of oil filter mounting studs.

b. Remove protective closure from gearbox. Position oil filter on gearbox studs and insert transfer tube in main pump assembly. (See figure 7, Sheet 1.)

c. Install washers and nuts on gearbox studs. Torque nuts 54 to 60 pound-inches.

d. Remove protective closure from oil filter bypass valve. Lubricate two PN 4069414 packings with a light coat of MIL-L-7808 or VV-P-236 petrolatum. Install packings on cold start valve oil supply manifold. Install oil supply manifold on oil filter and oil filter bypass valve.

e. Put a light coat of PWA 550 antigalling compound on threads of oil supply manifold flange bolts. Install bolts to fasten flanges to oil filter bypass valve and oil filter. Torque bolts 62 to 72 pound-inches.

f. Put a light coat of MIL-L-7808 oil on threads of oil supply damper bearing tube nut. Connect tube to oil supply manifold and torque 65 to 75 pound-inches.

g. Align outer section of block clamp. Torque nuts 23 to 26 pound-inches.

h. Remove protective closure from main fuel gear pump and augmentor fuel pump.

i. Lubricate PN MS9967-225 packing with a light coat of MIL-L-7808 oil or VV-P-236 petrolatum. Install packing on augmentor fuel pump PF1 tube elbow and install elbow on main gear fuel pump. Align bolt holes.

j. Put a light coat of PWA 550 antigalling compound on threads of augmentor fuel pump PF1 tube elbow mounting bolts. Install and torque bolts 125 to 140 pound-inches.

k. Lubricate two PN MS9967-133 packings with a light coat of MIL-L-7808 oil or VV-P-236 petrolatum. Install packings on augmentor fuel pump PF1 front tube and install tube on augmentor fuel pump and augmentor fuel pump PF1 rear tube.

l. Put a light coat of PWA 550 antigalling compound on threads of bolts securing augmentor fuel pump PF1 front tube to augmentor fuel pump and augmentor fuel pump PF1 rear tube. Install and torque bolts. (See figure 7, sheet 2.)

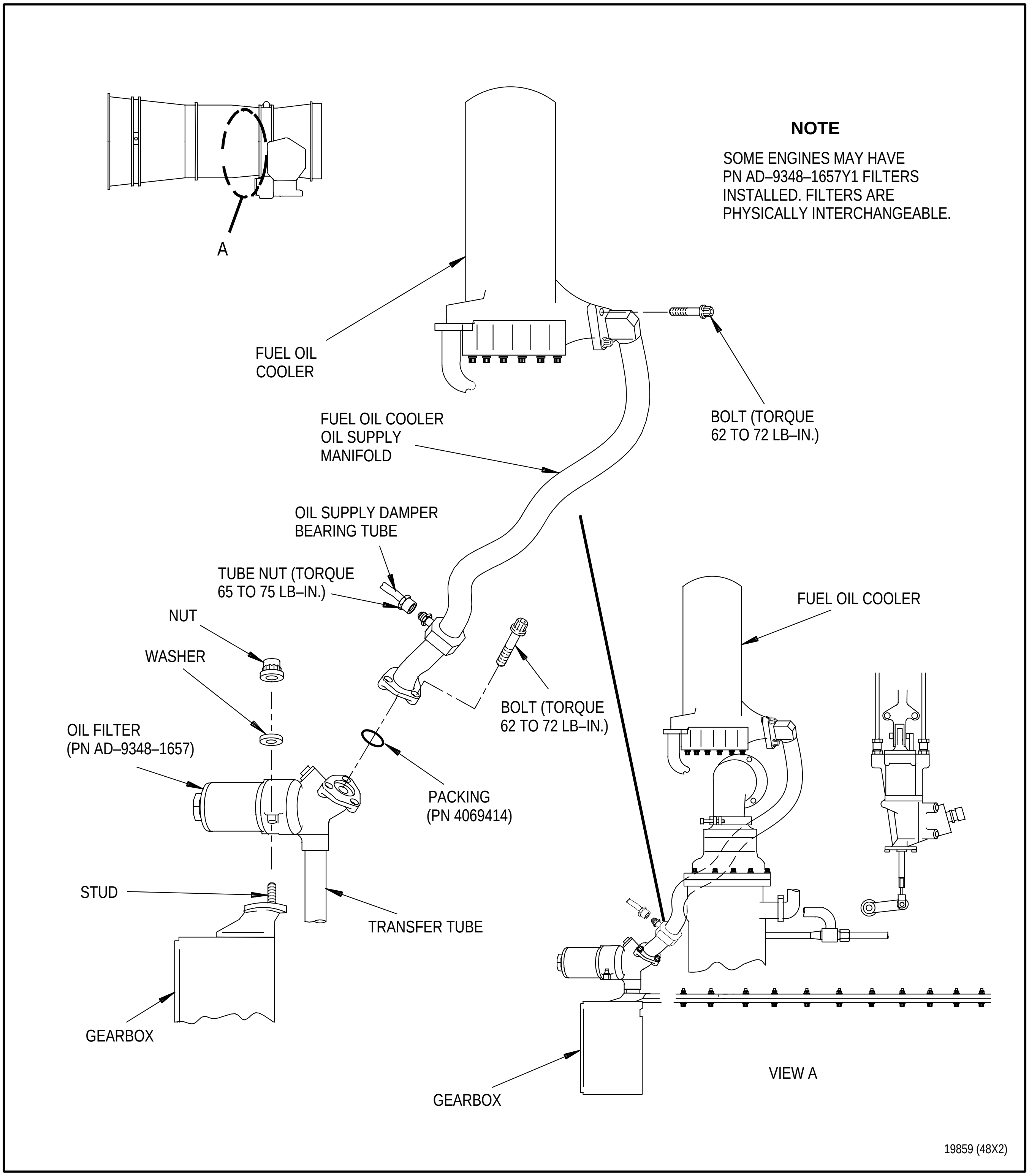


Figure 7. Oil Filter - Installation (Sheet 1 of 2)

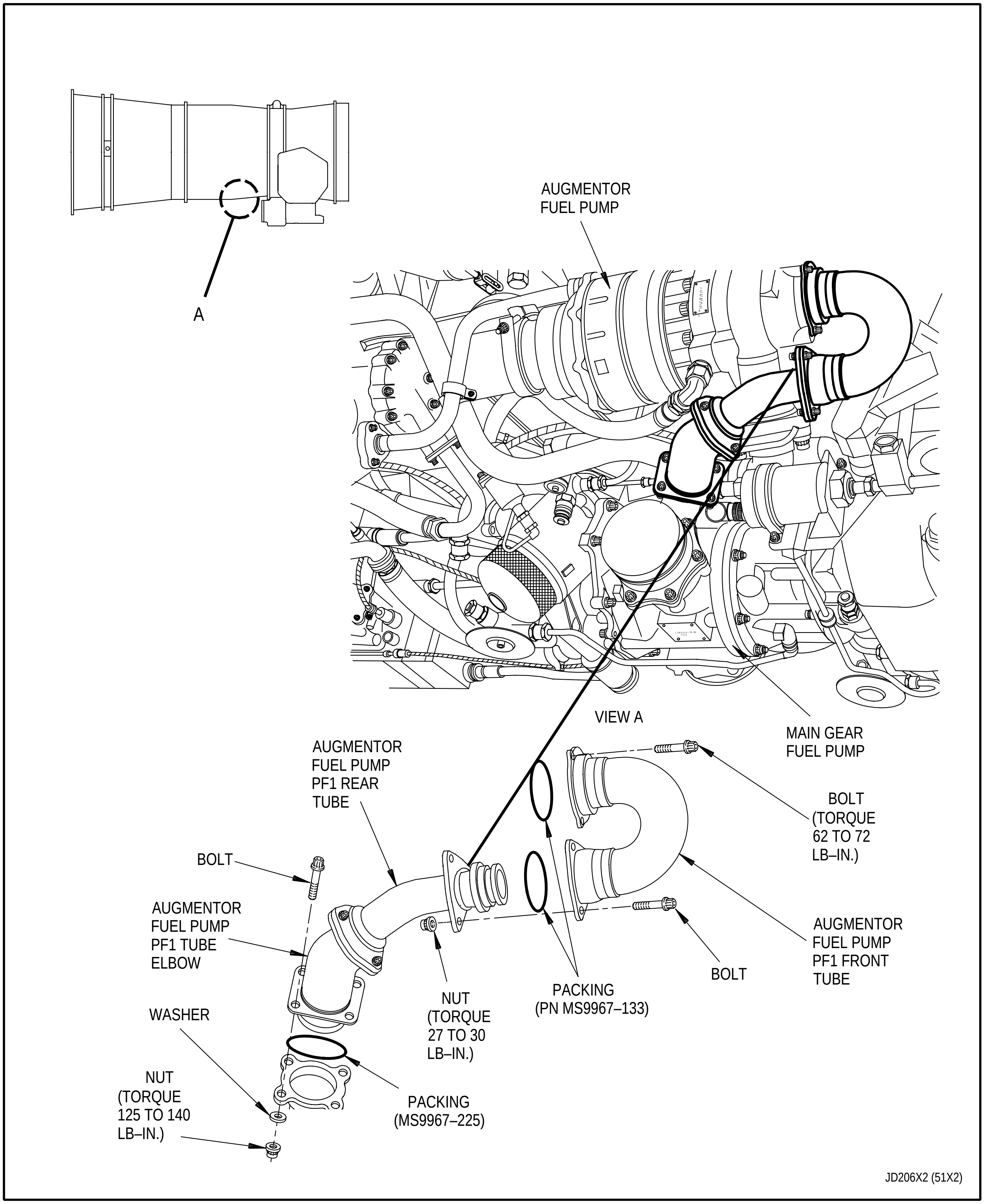


Figure 7. Oil Filter - Installation (Sheet 2 of 2)

WORK PACKAGE

TECHNICAL PROCEDURES

TANK ASSEMBLY - LUBRICATING OIL

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 28

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2	24	15 - 16	19	20	0
3	19	16A	5	21 - 23	21
4 - 5	21	16B Blank	3	24	0
6 - 11	0	17 - 18	24	25	7
12 - 13	19	19	21	26 Blank	0
14	5				

REFERENCE MATERIAL REQUIRED

Title	Number
Standard Maintenance Procedures	T.O. 2-1-111
Introduction and General Information	T.O. 2J-F100-53-1
Vapor Degreasing (SPOP 3)	SWP 031 01
Two Step Carbon Solvent and Paint Stripper (SPOP 7)	SWP 031 04
Engine Accessories and Rigging Procedures	T.O. 2J-F100-53-4
Pressure (Oil) Transmitter	WP 029 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
ADHESIVE	ECCOBOND 104 (PWA 36023) OR 676355
CLOTH, LINT FREE	-
COMPOUND, ANTIGALLING	HI-T-650 OR LUBRI-BOND HT (PWA 550)
LOCKWIRE(0.032 INCH DIAMETER)	MS9226-04
LOCKWIRE(0.040 INCH DIAMETER)	MS9226-05
LUBRICANT, SEALING RING	ULTRACHEM ASSEMBLY FLUID NO. 1 (PWA 36500)
OIL, LUBRICATING,	MIL-L-7808 OR
PETROLATUM (ALTERNATE TO OIL)	VV-P-236
PRIMER, ZINC CHROMATE	AMS 3110
PRIMER, ZINC CHROMATE	TT-P-1757
SOLVENT, PETROLEUM	P-D-680, TYPE II

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Insulation, oil tank, strap	4071815	AR
Packing, preformed	ST1000-011	1
Packing, preformed	ST1000-128	1
Packing, preformed	ST1000-131	1
Packing, preformed	ST1000-214	2
Packing, preformed	ST1000-215	3
Packing, preformed	ST1000-219	1
Packing, preformed	ST1051-08	1
Packing, preformed	ST1051-10	1
Packing, preformed	ST1051-12	1

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
2	Lubricating Oil Tank Assembly - Removal	
	Cap - Drain lubricating oil tank ----------	PWA 51192
	Puller - Oil tank strainer element ---------	PWA 53852

ILLUSTRATED SUPPORT EQUIPMENT

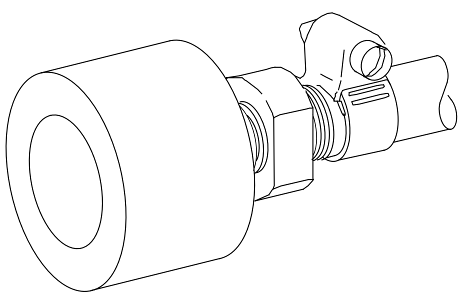


Figure T1. PWA 51192 Cap

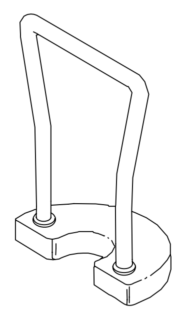


Figure T2. PWA 53852 Puller

1. INTRODUCTION.

a. This work package contains instructions for following maintenance procedures on lubricating oil tank assembly:

- Removal
- Disassembly
- Cleaning
- Lubricating oil tank cone strainer element assembly - Cleaning
- Lubricating oil tank assembly and oil tank strap - Inspection
- Lubricating oil tank assembly upper and lower chafe strips - Repair
- Lubricating oil tank cone strainer element assembly - Inspection
- Oil tank cone strainer element - Repair
- Lubricating oil tank indicator frame, gaskets, and lens - Replacement
- Assembly
- Installation

2. LUBRICATING OIL TANK ASSEMBLY - REMOVAL.

(See Figure 1.)

a. Drain oil from oil tank and main gearbox chip detector using one of following two methods:

(1) Drain oil using PWA 51192 cap as follows: (See figure 1, Sheet 1.)

(a) Place a 5 gallon container under oil tank drain cap and gearbox chip detector.

(b) Remove drain cover from drain and sampling valve. Install PWA 51192 cap. Place hose from cap into container and allow oil to drain from tank.

(c) After oil has drained from tank, remove cap. Replace drain cover on drain and sampling valve.

(d) Remove gearbox chip detector from gearbox and allow oil to drain into container. Discard packing on gearbox chip detector valve.

NOTE

PWA 36500 is preferred for lubricating preformed packings.

(e) Lubricate new packing and threads of gearbox chip detector valve with PWA 36500 assembly fluid or MIL-L-7808 oil only. Install packing on valve.

CAUTION

Failure to properly torque and lockwire gearbox chip detector valve may result in loss of chip detector leading to possible oil loss and damage to engine bearings.

(f) Install chip detector valve in gearbox and torque 115 to 130 pound-inches. Lockwire valve with PN MS9226-04 wire.

(g) Install chip detector.

(2) Drain oil by removing drain and sampling valve as follows:

(a) Place a 5 gallon container under oil tank drain and sampling valve.

(b) Support valve housing boss of oil tank with wrench when removing valve.

(c) Remove drain and sampling valve from oil tank, and discard packing.

(d) Allow oil to drain from tank.

NOTE

PWA 36500 is preferred for lubricating preformed packings.

(e) Lubricate PN ST1051-08 packing and threads of drain and sampling valve with a light coat of PWA 36500 assembly fluid or MIL-L-7808 oil only.

(f) Install packing on valve, and install valve in port of lower oil tank boss.

(g) Torque valve 50 to 75 pound-inches.

(h) Lockwire valve with PN MS9226-05 wire.

(i) Remove gearbox chip detector and chip detector valve from gearbox and allow oil to drain into container. Discard packing.

NOTE

PWA 36500 is preferred for lubricating preformed packings.

(j) Lubricate new packing and threads of gearbox chip detector with PWA 36500 assembly fluid or MIL-L-7808 oil only. Install packing on valve.

(k) Torque valve 115 to 130 pound-inches, and lockwire with PN MS9226-04 wire.

(l) Install chip detector.

b. Remove bolt and nut securing oil tank breather manifold to breather transfer tube (with flange).

c. Support oil tank and remove mounting hardware as follows: (See figure 1, sheets 2 and 3.)

(1) Remove nuts from strap bolts securing lower oil tank strap assembly to lower oil tank bracket assembly.

(2) Remove nut from strap bolt securing upper oil tank strap assembly to upper oil tank bracket assembly.

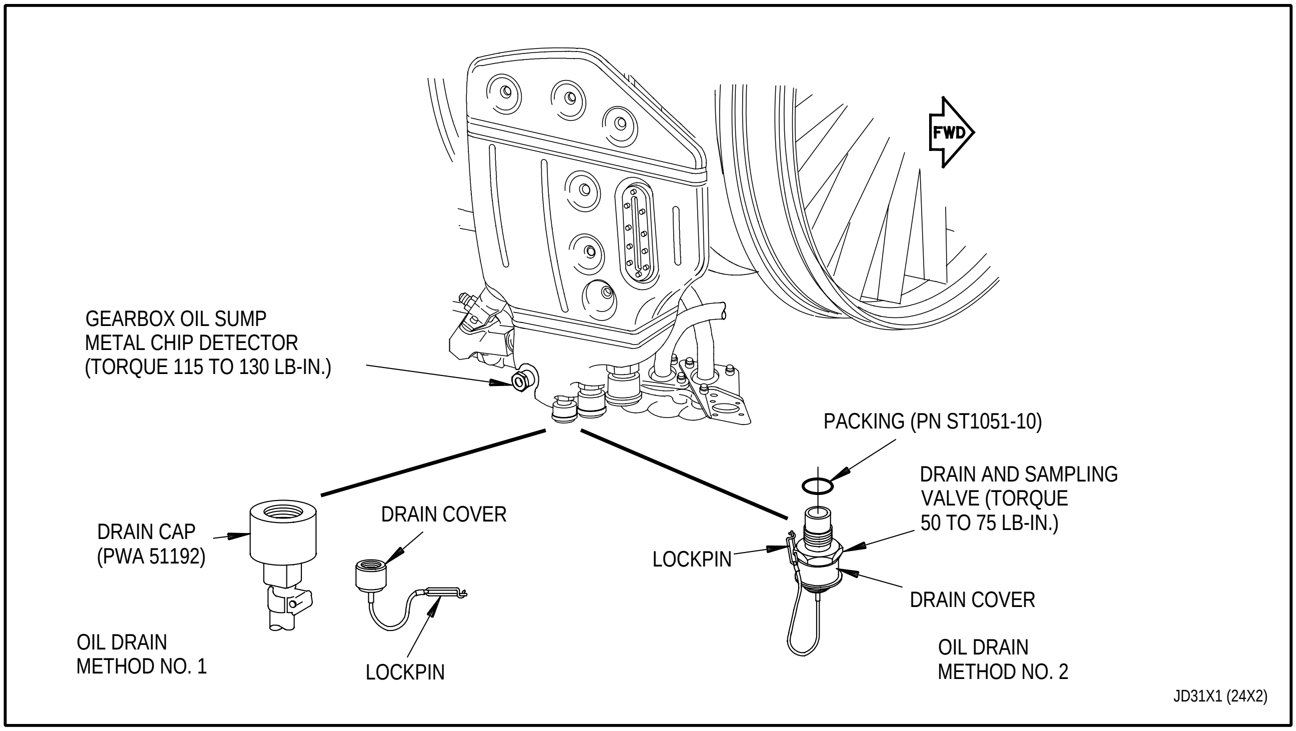


Figure 1. Lubricating Oil Tank - Removal (Sheet 1 of 3)

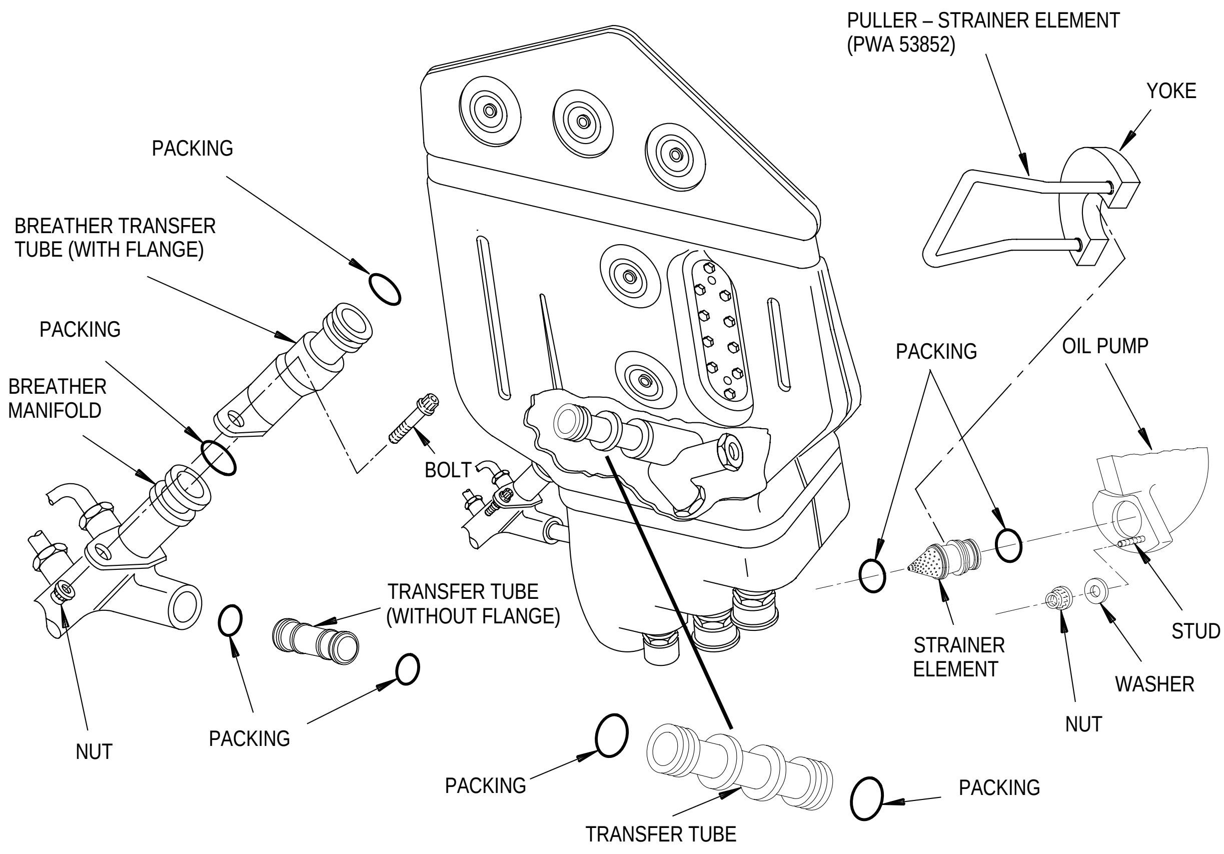


Figure 1. Lubricating Oil Tank - Removal (Sheet 2 of 3)

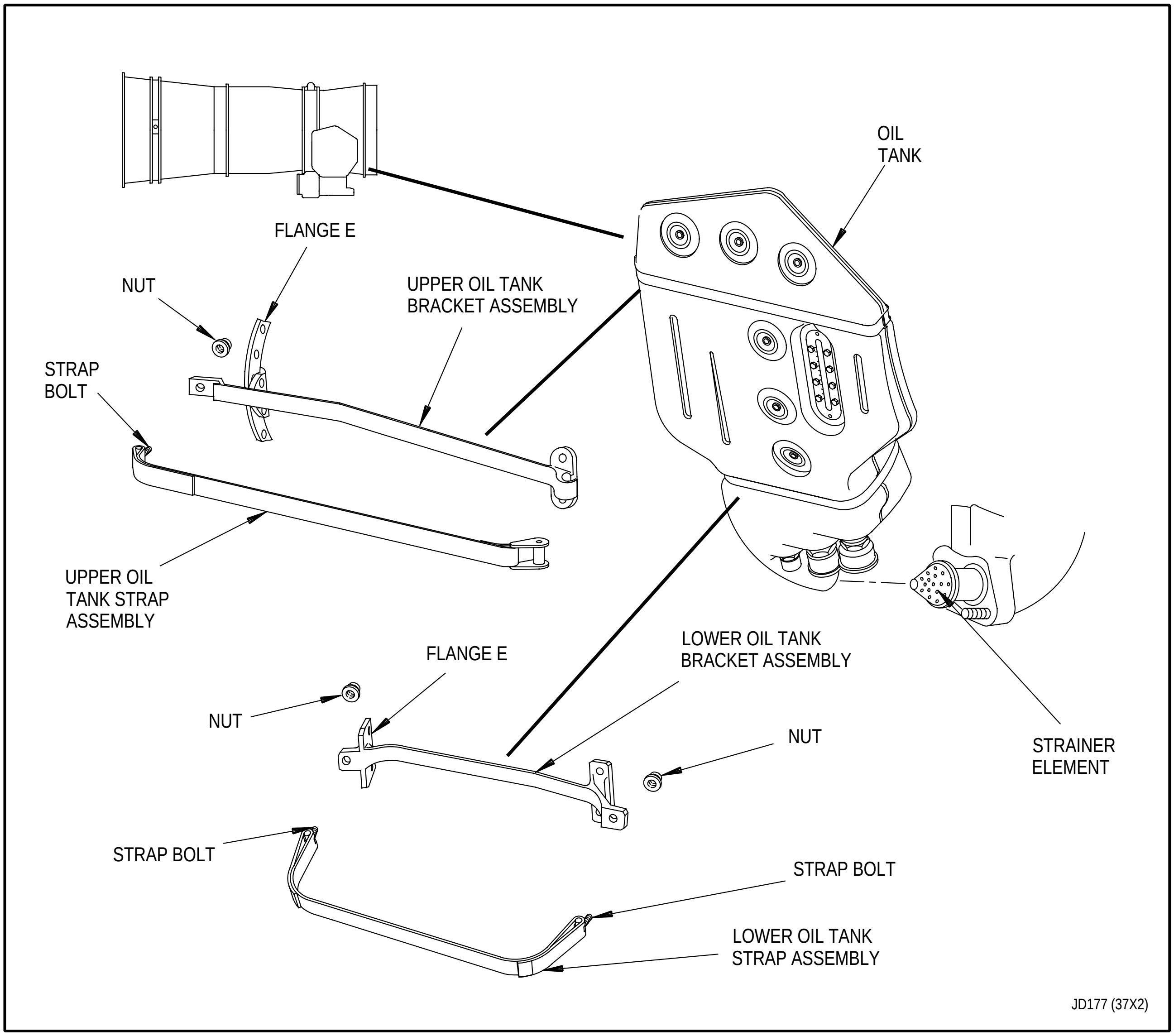


Figure 1. Lubricating Oil Tank - Removal (Sheet 3 of 3)

CAUTION

- Remove oil tank carefully to prevent damage to oil tank cone strainer element assembly and transfer tubes.
- Foreign objects in oil system may cause main oil pump seizure and result in loss of oil pressure and engine shutdown.

d. Install protective closures on all oil tank and engine openings upon removal of tank from engine or upon any discontinuance of work.

e. Lift oil tank off breather manifold, transfer tube, and strainer element.

f. Remove packing from exposed end of breather manifold. Discard packing. Install protective closure on breather manifold.

g. Remove transfer tube from engine. Remove and discard packings. Install protective closure on fitting in engine.

h. Remove nut and washer holding strainer element in main pump assembly.

CAUTION

Strainer element packings expand after engine operation. Do not attempt to pry strainer element from pump as damage to element may result. Use specified puller to remove element.

i. Remove strainer element from pump as follows:

(1) Place yoke of PWA 53852 puller around neck of strainer element and pull element from pump.

(2) Remove packings from strainer element. Discard packings. Store strainer element in protective container.

(3) Place protective closure on strainer port of pump.

j. Remove oil tank breather transfer tube (with flange) from oil tank. Discard packing.

k. Remove oil tank breather transfer tube (without flange) from oil tank. Discard packing.

l. Install protective closure on oil tank breather port.

3. LUBRICATING OIL TANK ASSEMBLY - DISASSEMBLY.
(See Figure 2.)

a. Remove adapter covers from oil tank overflow drain and remote fill inlet ports.

CAUTION

Hold wrenching flats of oil tank adapter bosses with wrench when removing adapters to prevent adapter bosses from turning and damaging oil tank.

b. Remove adapters from oil tank overflow drain and remote fill inlet. Discard packings.

c. Remove drain cover from oil tank drain and sampling valve port.

d. Remove drain and sampling valve from oil tank. Discard packings.

e. Disassemble drain and sampling valve as follows:

(1) Manually compress spring and remove pin.

(2) Remove valve, spring, and spring seat from valve housing.

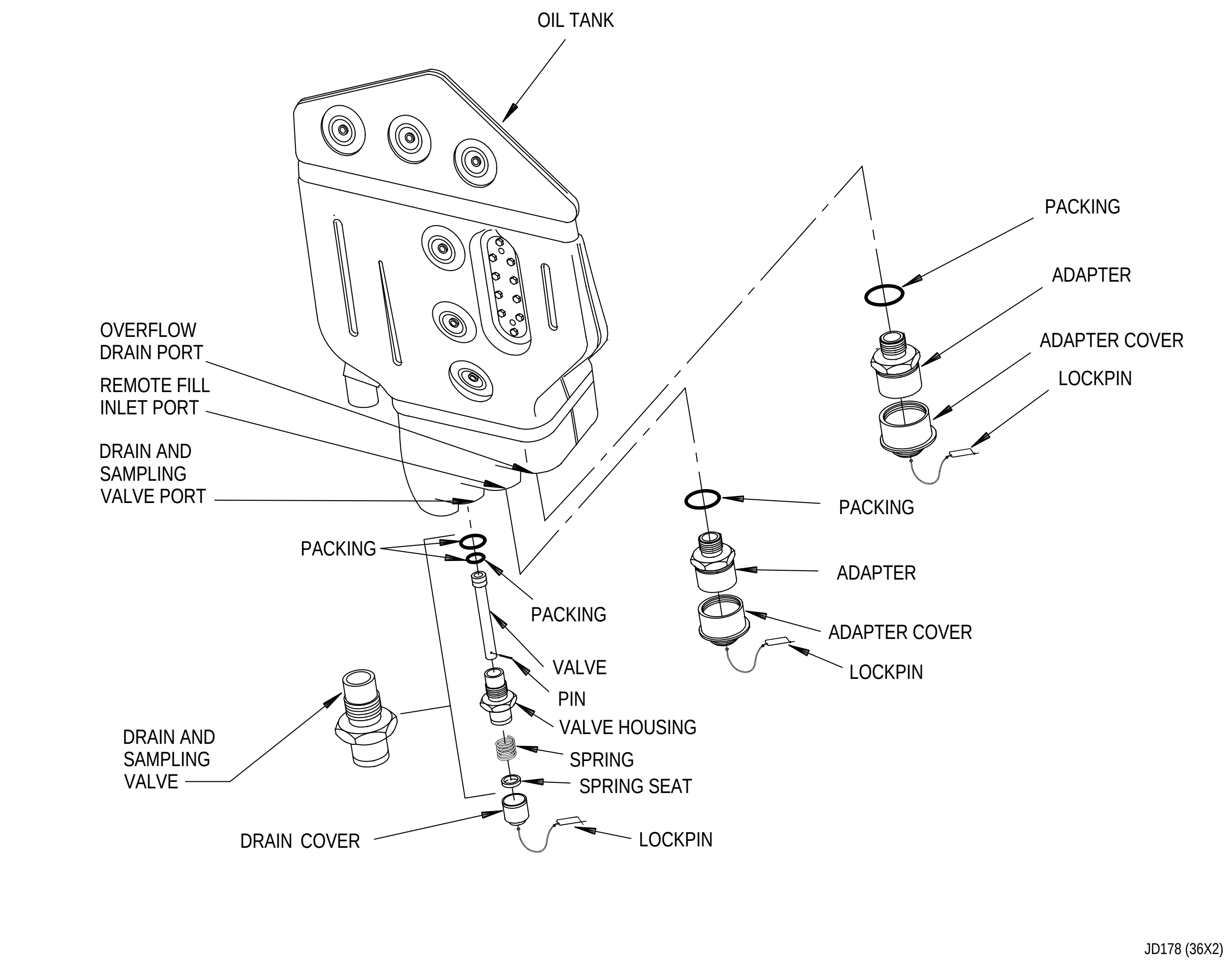


Figure 2. Lubricating Oil Tank Assembly - Disassembly

4. LUBRICATING OIL TANK ASSEMBLY - CLEANING.

CAUTION

Do not use PMC 9047 solvent on oil tank assembly. If solvent is used, damage to aluminum material will result.

a. Clean oil tank assembly. Refer to T.O. 2-1-111, SPOP 7, except use of PMC 9047 solvent is prohibited and refer to T.O. 2J-F100-53-1, SWP 031 04.

NOTE

Solvent shall not be allowed to enter oil tank when cleaning behind sight glass.

b. Hand wipe sight glass and wall behind it with clean cloth moistened with P-D-680, Type II petroleum solvent or equivalent. Air dry.

5. LUBRICATING OIL TANK CONE STRAINER ELEMENT ASSEMBLY - CLEANING.

a. Vapor degrease cone strainer element per SPOP 3. Refer to T.O. 2J-F100-53-1, SWP 031 01.

6. LUBRICATING OIL TANK ASSEMBLY AND OIL TANK STRAP - INSPECTION.

(See Figure 3.)

NOTE

Inspection of upper and lower oil tank brackets is located in T.O. 2J-F100-53-5, WP 412 00. Installation of upper and lower oil tank brackets is located in T.O. 2J-F100-53-5, WP 703 00.

a. Inspect lubricating oil tank assembly. (See figure 3.)

b. Inspect upper and lower oil tank straps. (See figure 3.)

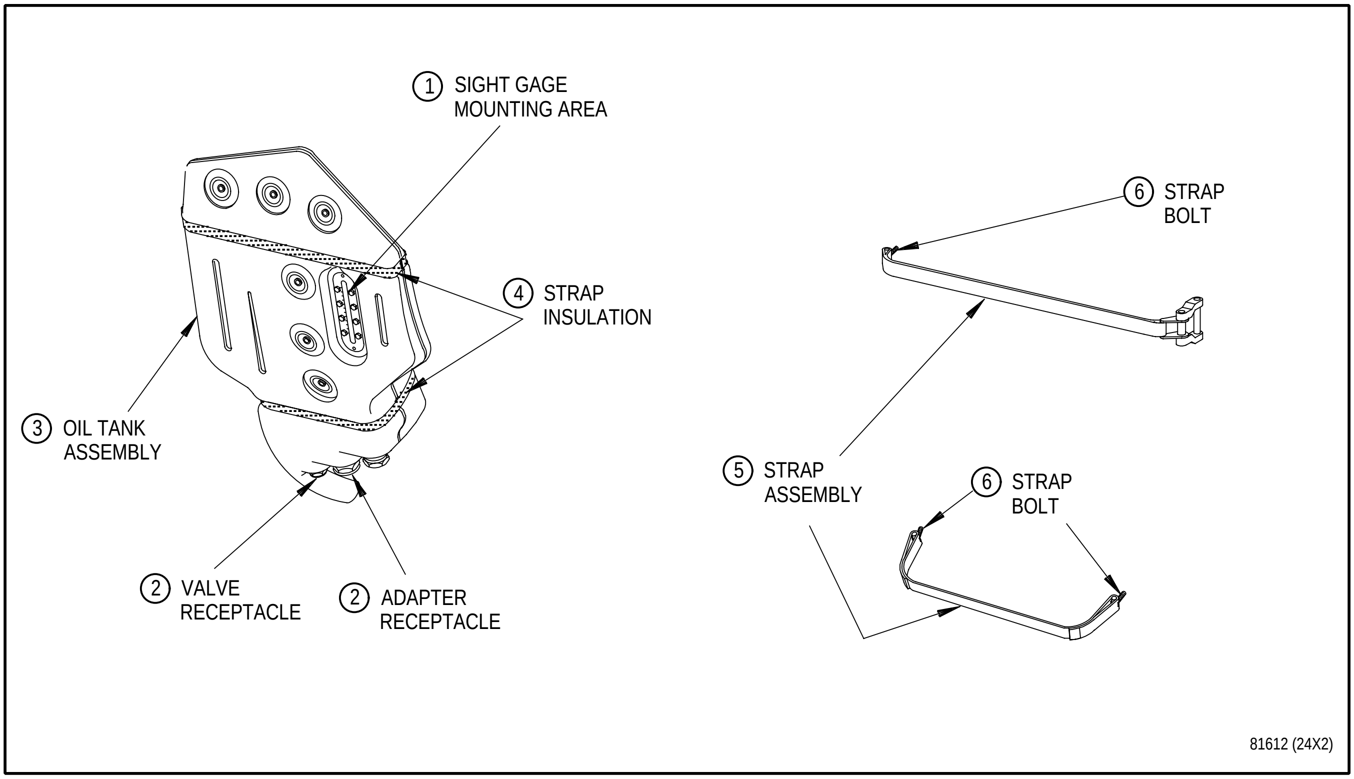


Figure 3. Lubricating Oil Tank Assembly and Oil Tank Straps - Inspection

Legend for figure 3

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Sight gage mounting area -			
Leakage	Not serviceable	Any amount as long as leakage stops	Repair. Refer to paragraph 8.
Discoloration of sight glass and wall behind glass	Readable	Any amount	Clean. Refer to paragraph 4.
2. Adapter and valve receptacles -			
Leakage	Not serviceable	Not reparable	Replace oil tank assembly.
3. Oil tank assembly -			
Surface crack	Not serviceable	Not reparable	Replace oil tank assembly.
Dents	Well-rounded dents 0.125 inch deep maximum and 4 square inches maximum in area. If dent crosses welded seams, FPI. Refer to T.O. 2-1-111.	Not reparable	Replace oil tank assembly.
Nicks, scratches	0.021 inch deep maximum with no sharp edges	0.021 inch deep maximum if sharp edges are removed	Remove sharp edges only. Replace tank assembly if reparable limit is exceeded.
Distortion of tank which causes misalignment or binding with engine brackets	Not serviceable	Not reparable	Replace oil tank assembly.

Legend for figure 3 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
3. Oil tank assembly (continued) -			
Upper chafe strip edge - Cracks	Not serviceable	2 inch total length. Remove edge material local to crack and blend smooth	Replace tank assembly if reparable limit is exceeded.
Upper chafe strip edge - Missing	2 inch length total with no sharp edges	Remove sharp edges only	Replace tank assembly exceeding serviceable limit.
Lower chafe strip edge - Cracks	Not serviceable	1 inch total length. Above edge material local to crack and blend smooth	Replace tank assembly if reparable limit is exceeded.
Lower chafe strip edge - Missing	1 inch length total with no sharp edges	Remove sharp edges only	Replace tank assembly exceeding serviceable limit.
4. Strap insulation -			
Edges missing	Areas up to 1/2 inch in length except at corners and ends of tank	Any amount	Repair per this WP.
Frayed in trough	No exposed metal	Any amount	Repair per this WP.
Unbonded	Not serviceable	Any amount	Repair per this WP.

Legend for figure 3 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
5. Strap assembly -			
Broken, cracked, or kinked	Not serviceable	Not reparable	Replace strap assembly.
6. Strap bolt -			
Damaged threads	Not serviceable	See corrective action.	Chase bolt threads, if necessary. If damaged beyond repair, replace strap assembly.

6A. LUBRICATING OIL TANK ASSEMBLY UPPER AND LOWER CHAFE STRIPS - REPAIR.

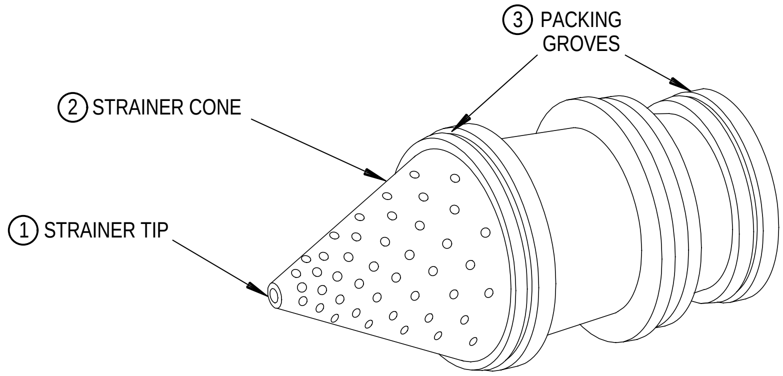
NOTE

The following repair is for worn or unbonded chafe strips on oil tank assembly.

a. Remove worn or unbonded chafe strips and clean contact area per SPOP 7. Refer to T.O. 2J-F100-53-1, SWP 031 04.

b. Using old insulation or template, cut PN 4071815 replacement insulation as required and secure with PWA 36023 adhesive.

c. Cure at 335° to 365°F (167° to 186°C) for 2 hours.



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Strainer tip -			
Damaged	Hole up to 0.125 inch diameter	Any amount	Replace cone strainer.
2. Strainer cone -			
Cracks	0.250 inch in length, maximum three per strainer	Any amount	Replace cone strainer.
3. Packing grooves -			
Damaged	Not serviceable	Shall be capable of retaining packing	Deburr rough edges.

Figure 4. Lubricating Oil Tank Cone Strainer Element Assembly - Inspection

7. LUBRICATING OIL TANK CONE STRAINER ELEMENT ASSEMBLY - INSPECTION.

(See Figure 4.)

a. Inspect oil cone strainer element assembly. (See figure 4.)

8. OIL TANK CONE STRAINER ELEMENT - REPAIR.

a. Puddle weld repair any amount of damage to strainer tip of oil tank cone strainer element per PWA 16-4.

b. Refer to T.O. 2J-F100-53-1, WP 093 00.

c. Use AMS 4190 filler metal.

d. Weld repair any amount of cracks to strainer cone of oil tank cone strainer element per PWA 16-4.

e. Refer to T.O. 2J-F100-53-1, WP 093 00.

f. Use AMS 4190 filler metal.

9. LUBRICATING OIL TANK INDICATOR FRAME, GASKETS, AND LENS - REPLACEMENT.
(See Figures 5 and 6.)

a. Remove bolts holding oil tank indicator frame to oil tank. Remove template gage, indicator frame, gaskets, and indicator lens.

b. Replace bent or broken frame, worn or broken gaskets, or broken lens.

c. Position gaskets, indicator lens, indicator frame and template gage on oil tank. (See figure 5.)

d. Apply AMS 3110 zinc chromate primer to threads of bolts and shoulder contact area.

e. Install bolts fingertight.

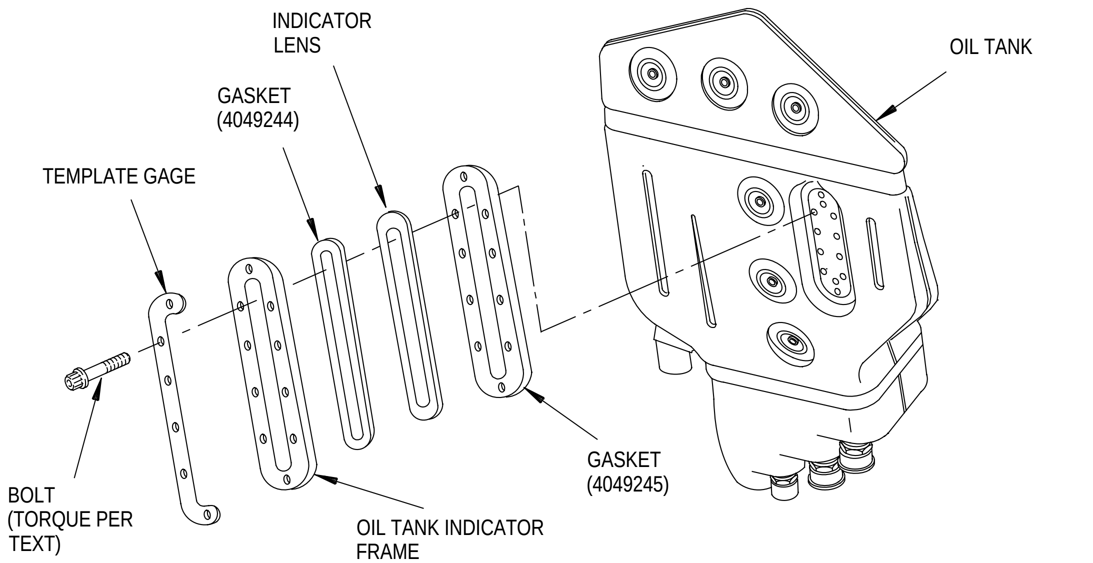


Figure 5. Lubricating Oil Tank Indicator Frame, Gaskets, and Lens - Replacement

CAUTION

Bolts shall be torqued in specified sequence to prevent breaking indicator lens.

f. Torque bolts 10 pound-inches in sequence shown. (See figure 6.)

g. Torque bolts 20 pound-inches in sequence shown.

g1. Torque bolts 23 to 27 pound-inches in sequence shown.

h. Lockwire bolts with PN MS9226-04. (See figure 6.)

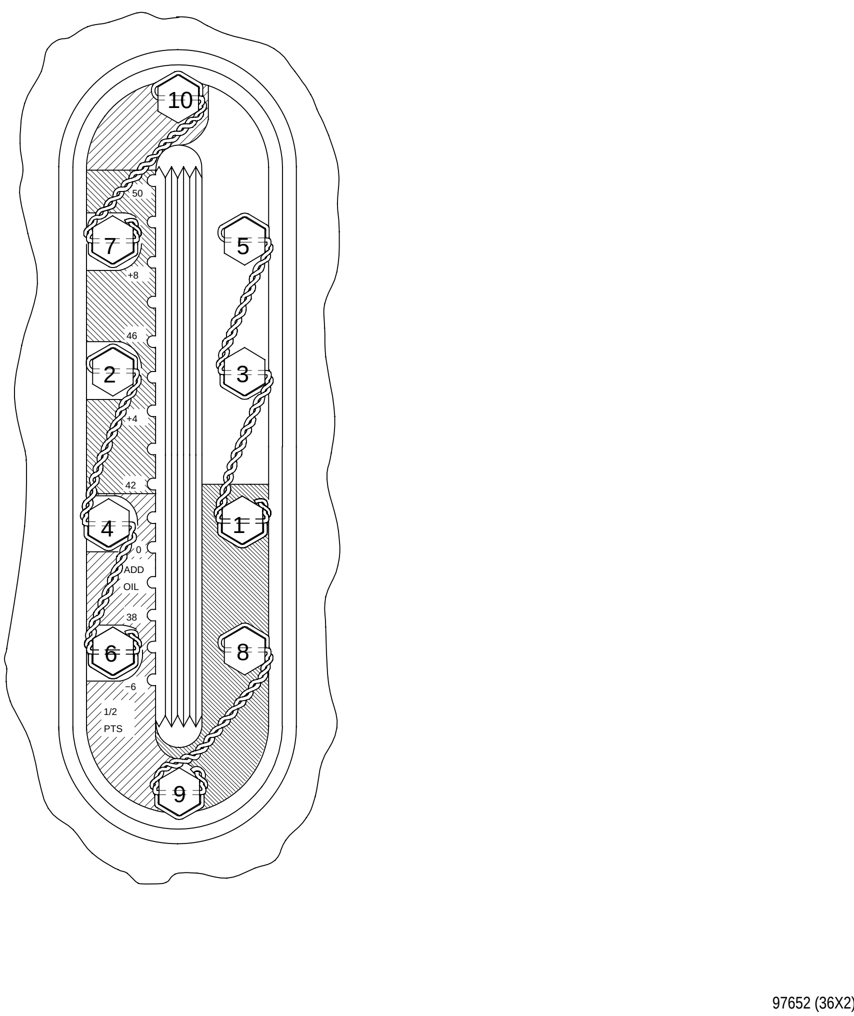


Figure 6. Lubricating Oil Tank Liquid Sight Indicator - Retaining Bolts Torquing Sequence

10. LUBRICATING OIL TANK ASSEMBLY - ASSEMBLY.
(See Figure 7.)

a. If required, remove corrosion preventive compound from oil tank and covers per SPOP 7. Do not use PMC 9047 solvent.

b. Assemble drain and sampling valve as follows: (See figure 7.)

NOTE

PWA 36500 is preferred for lubricating preformed packings.

(1) Lubricate PN ST1051-10 and ST1000-011 packings, threads of drain and sampling valve, and drain cover with a light coat of PWA 36500 assembly fluid or MIL-L-7808 oil only.

(2) Install PN ST1000-011 packing on valve.

(3) Insert valve into valve housing.

(4) Install spring and spring seat over lower end of valve.

(5) Manually compress spring and install pin.

c. Install PN ST1051-10 packing in port of drain and sampling valve.

d. Install assembled drain and sampling valve in oil tank. Support oil tank boss with wrench during installation of valve assembly and adapters to prevent damage to tank.

e. Torque 50 to 75 pound-inches. Lockwire valve with PN MS9226-05 wire.

f. Install drain cover. Secure lockpin to valve housing.

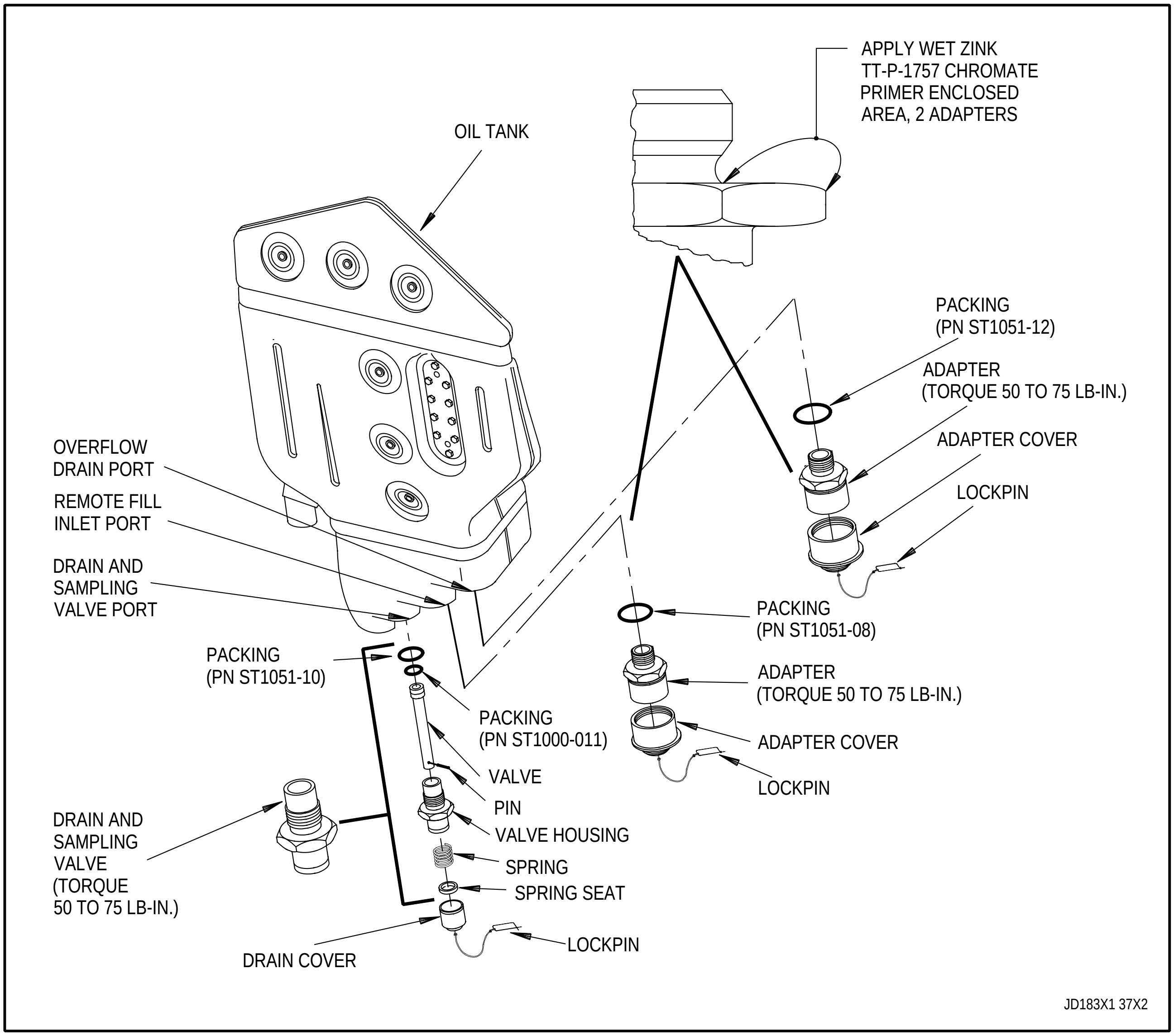


Figure 7. Lubricating Oil Tank Assembly - Assembly

g. Apply TT-P-1757 wet zinc chromate primer to adapters. (See figure 8.)

NOTE

PWA 36500 is preferred for lubricating preformed packings.

h. Lubricate PN ST1051-08 and ST1051-12 packings and threads of adapters with a light coat of PWA 36500 assembly fluid or MIL-L-7808 oil only.

i. Install larger adapter and PN ST1051-12 packing in overflow drain port of oil tank. Torque adapter 50 to 75 pound-inches. Lockwire adapter with PN MS9226-05 wire.

j. Install smaller adapter and PN ST1051-08 packing in remote fill inlet port of oil tank. Torque adapter 50 to 75 pound-inches. Lockwire adapter with PN MS9226-05 wire.

k. Install covers on adapters. Secure lockpins to adapters.

11. LUBRICATING OIL TANK ASSEMBLY - INSTALLATION.

(See Figure 8.)

a. Remove oil pressure transmitter per WP 029 00.

b. Remove oil tank breather manifold from gearbox as follows: (see figure 8)

(1) Remove three bolts securing manifold flange to gearbox.

(2) Disconnect oil pressure transmitter breather tube from manifold.

(3) Remove manifold from gearbox.

c. Install oil tank cone strainer element assembly as follows:

NOTE

PWA 36500 is preferred for lubricating preformed packings.

(1) Lubricate PN ST1000-131 and ST1000-128 packings with PWA 36500 assembly fluid or MIL-L-7808 oil only, and install onto cone strainer packing grooves. (See figure 8.)

NOTE

Washer and nut are not installed to secure cone strainer at this time.

(2) Install cone strainer element in oil tank port.

d. Install breather manifold transfer tubes into oil tank as follows:

NOTE

PWA 36500 is preferred for lubricating preformed packings.

(1) Lubricate two PN ST1050-214 packings with PWA 36500 assembly fluid or MIL-L-7808 oil only, and install onto breather manifold transfer tube (without flange). (See figure 8.)

CAUTION

Failure to use care when installing breather manifold tube may damage packings.

(2) Carefully install one end of breather manifold transfer tube into breather manifold. Avoid cutting packings

(3) Lubricate PN ST1000-219 packing with PWA 36500 assembly fluid or MIL-L-7808 oil only, and install onto breather manifold transfer tube (with flange).

(4) Install breather manifold tube (end without flange) into oil tank.

(5) Lubricate PN ST1000-218 packing with PWA 36500 assembly fluid or MIL-L-7808 oil only, and install on breather manifold flange.

e. Install transfer tube into gearbox tube connector as follows:

NOTE

PWA 36500 is preferred for lubricating preformed packings.

(1) Lubricate two PN ST1000-214 packings with PWA 36500 assembly fluid or MIL-L-7808 oil only, and install onto pack grooves in transfer tube.

(2) Install transfer tube into oil tank.

f. Apply a light coat of PWA 550 antigalling compound to threads of strap bolts on upper and lower oil tank strap assemblies.

CAUTION

Failure to carefully install oil tank may result in damage to tank fittings, mating components, and packings.

g. Position oil tank on engine, seating gearbox transfer tube in gearbox, bottom part of tank over cone strainer, tank channel groves in bracket assemblies, and breather manifold into gearbox.

CAUTION

Failure to properly install oil tank straps may damage tank resulting in an oil leak.

h. Install upper oil tank strap assembly as follows:

(1) Position upper oil tank strap assembly in oil tank channel groove.

(2) Install nut on strap bolt securing upper oil tank strap assembly to upper oil tank bracket assembly and torque until seated against bracket. Record torque required to thread nut.

(3) Torque nut 7 to 10 pound-inches above torque recorded in step (2).

i. Install lower oil tank strap assembly as follows:

   (1) Position lower oil tank strap assembly in oil tank channel groove.

   (2) Install nuts on strap bolts securing lower oil tank strap assembly to lower oil tank bracket assembly and torque until seated against bracket. Record torques required to thread nuts.

   (3) Torque nuts 7 to 10 pound-inches above torque recorded in step(2). Measure threads on strap bolts. They shall extend a minimum of 0.050 inch beyond nut.

j. Check clearance between upper oil tank strap assembly and oil tank skin using 0.040 inch feeler gage. See figure 8, sheet 2. If installed tank fails 0.040 inch feeler gage check; remove oil tank assembly and reinstall tank using new straps and brackets.

k. Install washer and nut on stud of oil pump to secure cone strainer. Torque nut 23 to 26 pound-inches.

l. Install three bolts into breather manifold flange on gearbox. Torque bolts 65 to 85 pound-inches and lockwire with PN MS9226-05 wire.

m. Install oil pressure transmitter per WP 029 00.

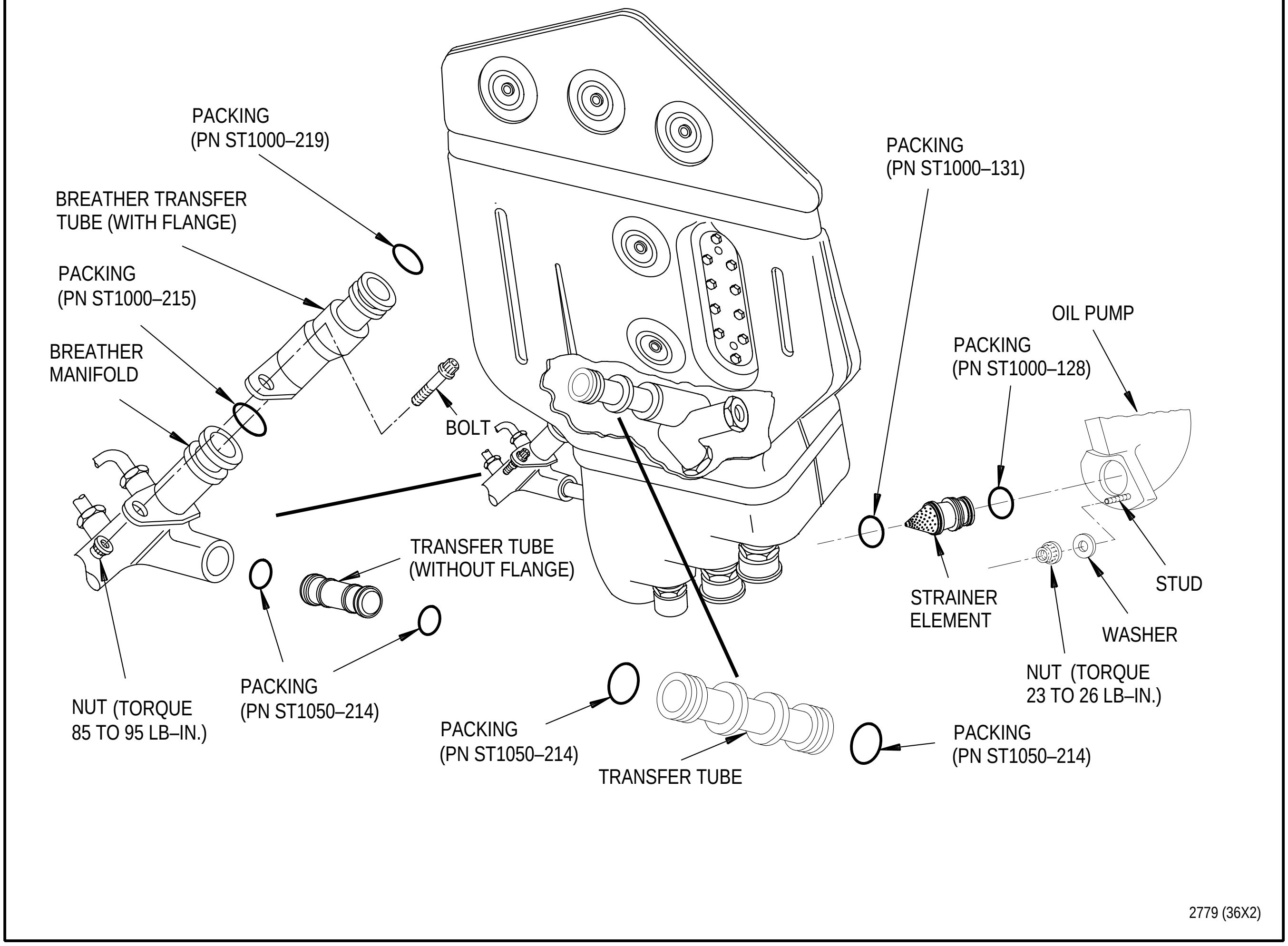


Figure 8. Lubricating Oil Tank - Installation (Sheet 1 of 2)

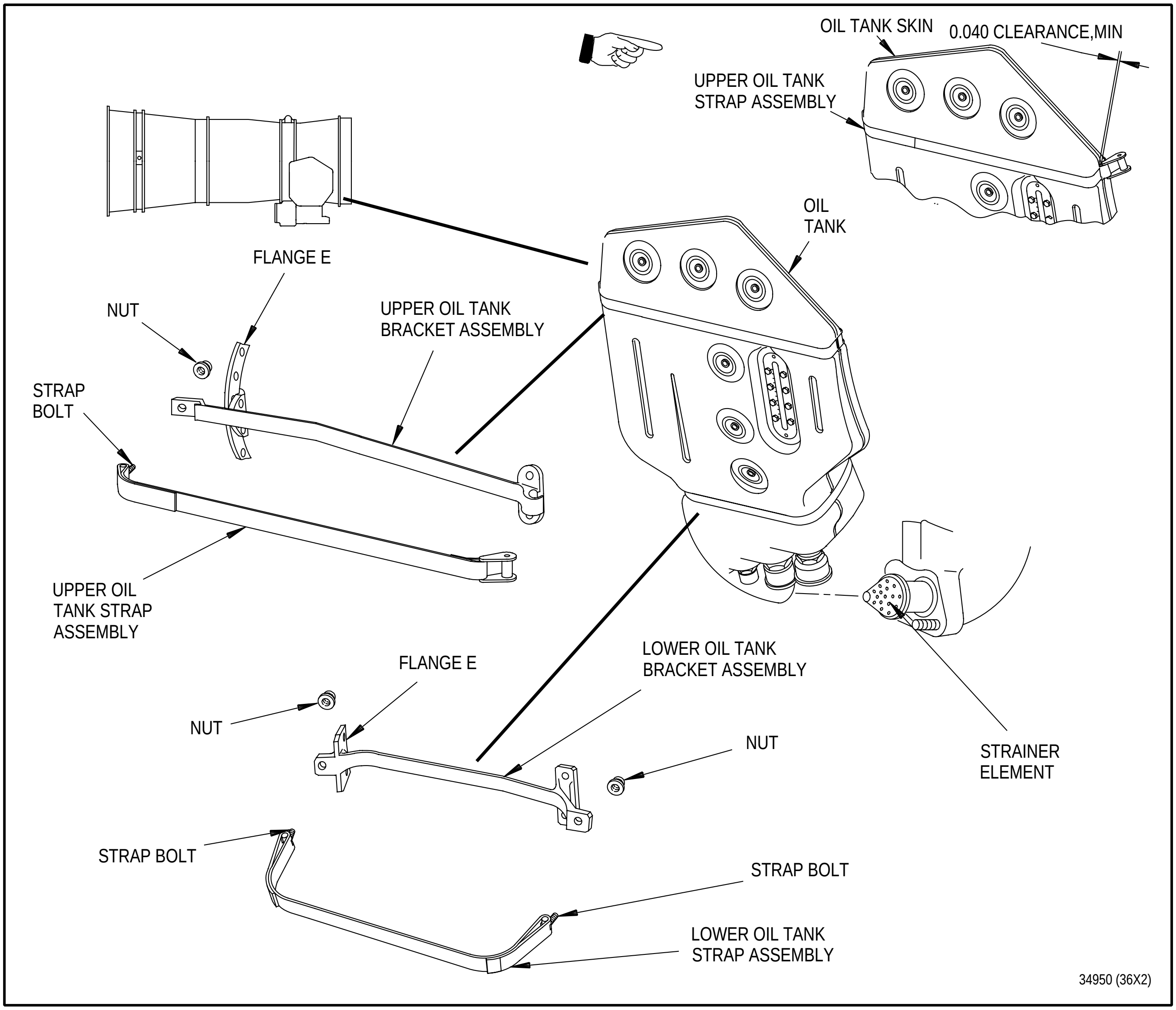


Figure 8. Lubricating Oil Tank - Installation (Sheet 2 of 2)

WORK PACKAGE

TECHNICAL PROCEDURES

PUMP ASSEMBLY - MAIN (OIL)

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 16

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2	21	6A	21	8 - 9	20
3	0	6B Blank	20	10 - 10B	21
4 - 5	21	7	0	11	21
6	20			12	0

REFERENCE MATERIAL REQUIRED

Title	Number
Engine Accessories and Rigging Procedures	T.O. 2J-F100-53-4
Tank Assembly - Lubricating Oil	WP 031 00
Detector - Metal Chip, Oil Sump	WP 033 00
Engine	T.O. 2J-F100-53-5
Cable, Hose, Tube, and Manifold Assemblies; Engine External - Installation, Routing, and Clamping	WP 064 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

T.O. No.	Date	Level	Title (ECP No.)
T.O. 2J-F100229-576	6 Dec 96	O/I	Installation of PN 4084415-01, Bracket Assembly, F100-PW-229 Engines, F-15/F-16 Aircraft (ECP 96QA080)

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Alcohol, isopropyl (PMC 9094)	TT-I-735
Bag, plastic, or equivalent	-
Barrier material, grease proofed, flexible (water-proofed)	MIL-B-121, Type II Grade A, Class 1
Cloth, lint-free	-
Compound, antigalling (PWA 550)	Hi-T-650 or Lubri-Bond HT
Lockwire (0.032 inch diameter)	MS9226-04
Oil, lubricating	MIL-L-7808 or
Petrolatum (alternate to oil)	VV-P-236
Solvent, petroleum	P-D-680, Type II
Tape, masking (cloth backing)	MYSTIK 5863 Red

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Gasket	4015507	1
Key washer	171752	2
Packing, preformed	AS3208-10	1
Packing, preformed	AS3209-016	1
Packing, preformed	AA3209-116	1
Packing, preformed	AS3209-218	1
Packing, preformed	ST1000-153	1
Packing, preformed	ST1000-214	2
Packing, preformed	ST1050-016	1
Packing, preformed	ST1051-10	1

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
5	Main Pump Assembly - Inspection	
	Adapter - Main pump, torque - - - - - - -	PWA 55419

ILLUSTRATED SUPPORT EQUIPMENT

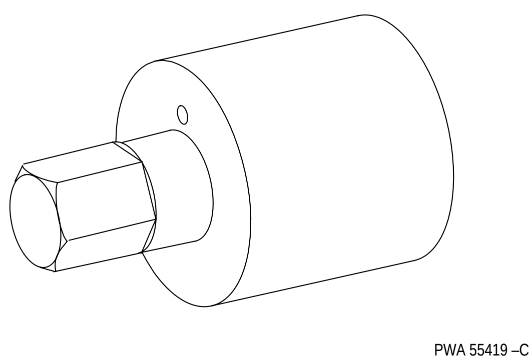


Figure T1. PWA 55419 Adapter

1. INTRODUCTION.

a. This work package contains the following maintenance procedures for the main oil pump assembly:

- Preliminary instructions
- Removal
- Cleaning
- Inspection
- Installation
- Follow-on maintenance
- Storage and shipment

2. PRELIMINARY INSTRUCTIONS.

a. Remove lubricating oil tank assembly per WP 032 00.

3. MAIN OIL PUMP ASSEMBLY - REMOVAL.

(See Figures 1 and 1A.)

a. Loosen pump oil supply tube nut and disconnect tube from adapter. (See figure 1, Sheet 1.) Install protective closure on pump oil supply tube.

b. Remove nuts securing oil tank scavenge tube to upper pad of main pump assembly. Disconnect tube. Remove and discard packing. Place protective closure on tube.

c. Remove nuts securing No. 1 and 4 bearing scavenge tubes to main pump assembly. Disconnect tubes. Remove and discard packings. Place protective closures on tubes and electrical plugs.

NOTE

- Engine configuration with flex/hard anti-siphon tube incorporates a bracket over No. 4 scavenge blank-off plate which secures main bearing inlet pressure manifold and anti-siphon tube.
- It is not necessary to remove clamps securing tubes from bracket.

d. If present, remove nuts securing bracket to No. 4 scavenge blank-off plate. (See figure 1A.)

e. Remove nuts securing main bearing inlet pressure manifold. Disconnect manifold. Remove and discard packing. Place protective closure on tube.

f. Remove nuts securing bracket and No. 5 bearing scavenge tube to main pump assembly. Disconnect bracket and tube. Remove and discard packing. Place protective closure on tube.

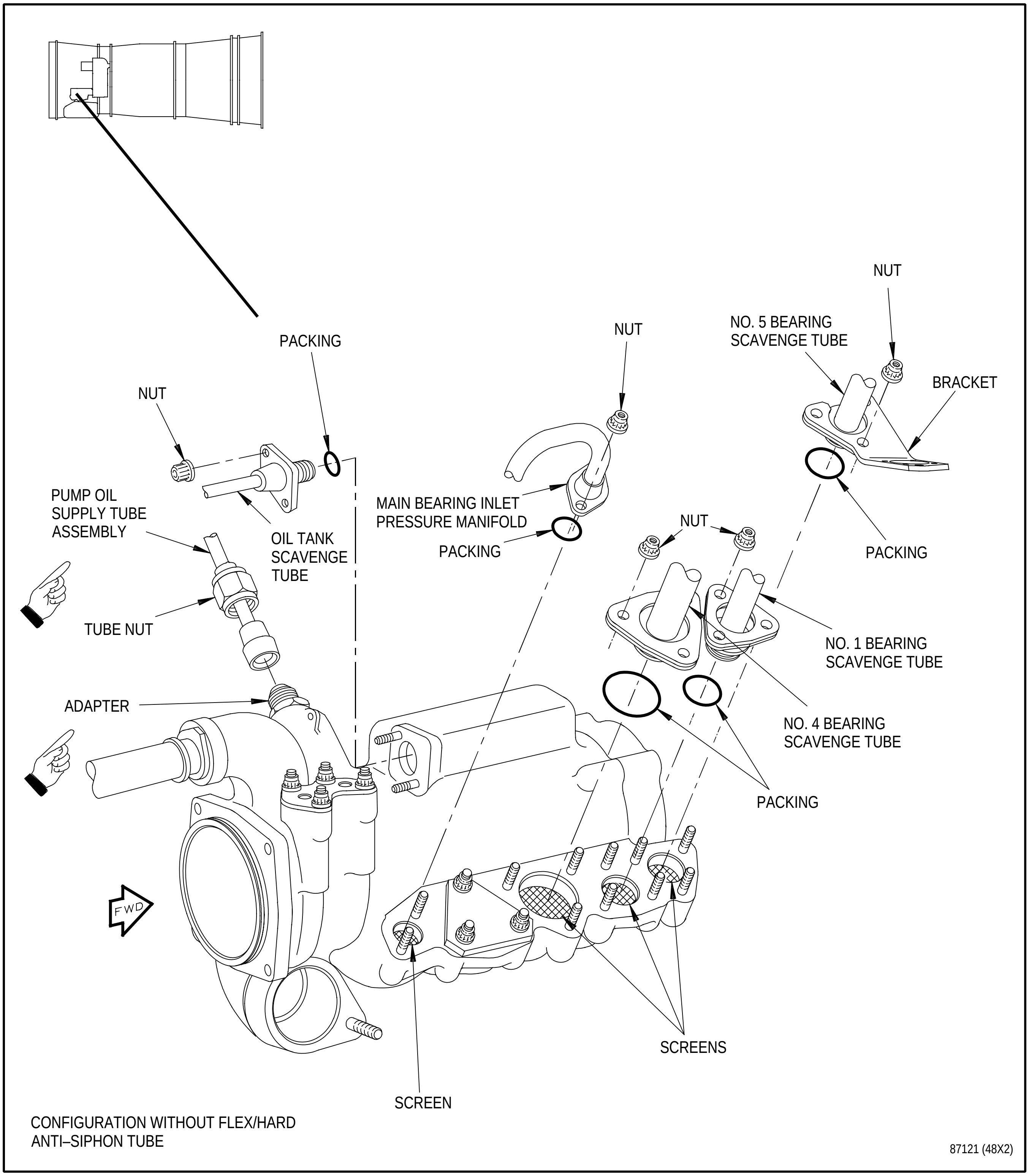


Figure 1. Main Oil Pump Assembly (Without Flex/Hard Anti-Siphon Tube) - Removal (Sheet 1 of 2)

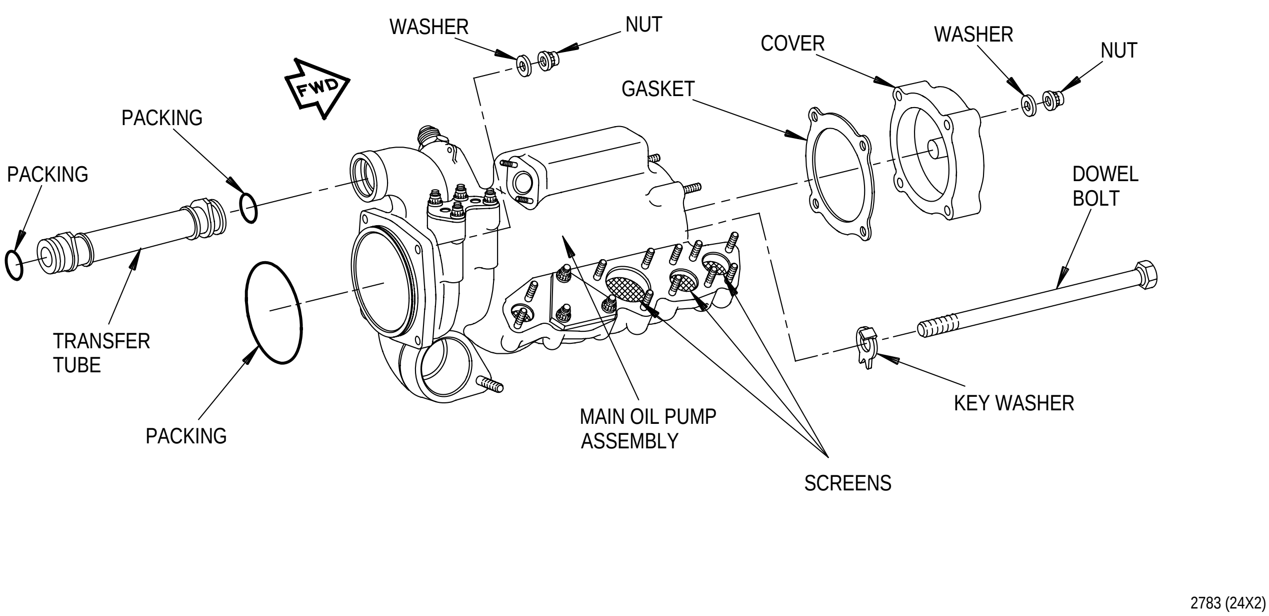


Figure 1. Main Oil Pump Assembly (Without Flex/Hard Anti-Siphon Tube) - Removal (Sheet 2 of 2)

CAUTION

Failure to support pump on the engine by hand while removing attaching parts may damage mating splines.

g. Supporting pump by hand, remove nuts and washers holding cover to front of pump. (See figure 1, Sheet 2). Remove cover. Remove and discard gasket.

h. Straighten tabs of key washers on dowel bolts. Remove bolts. Remove and discard key washers.

i. Remove nuts and washers holding pump to gearbox. Remove pump. Remove packing from mating flange of pump. Discard packing.

j. Remove transfer tube from pump. Remove and discard packings.

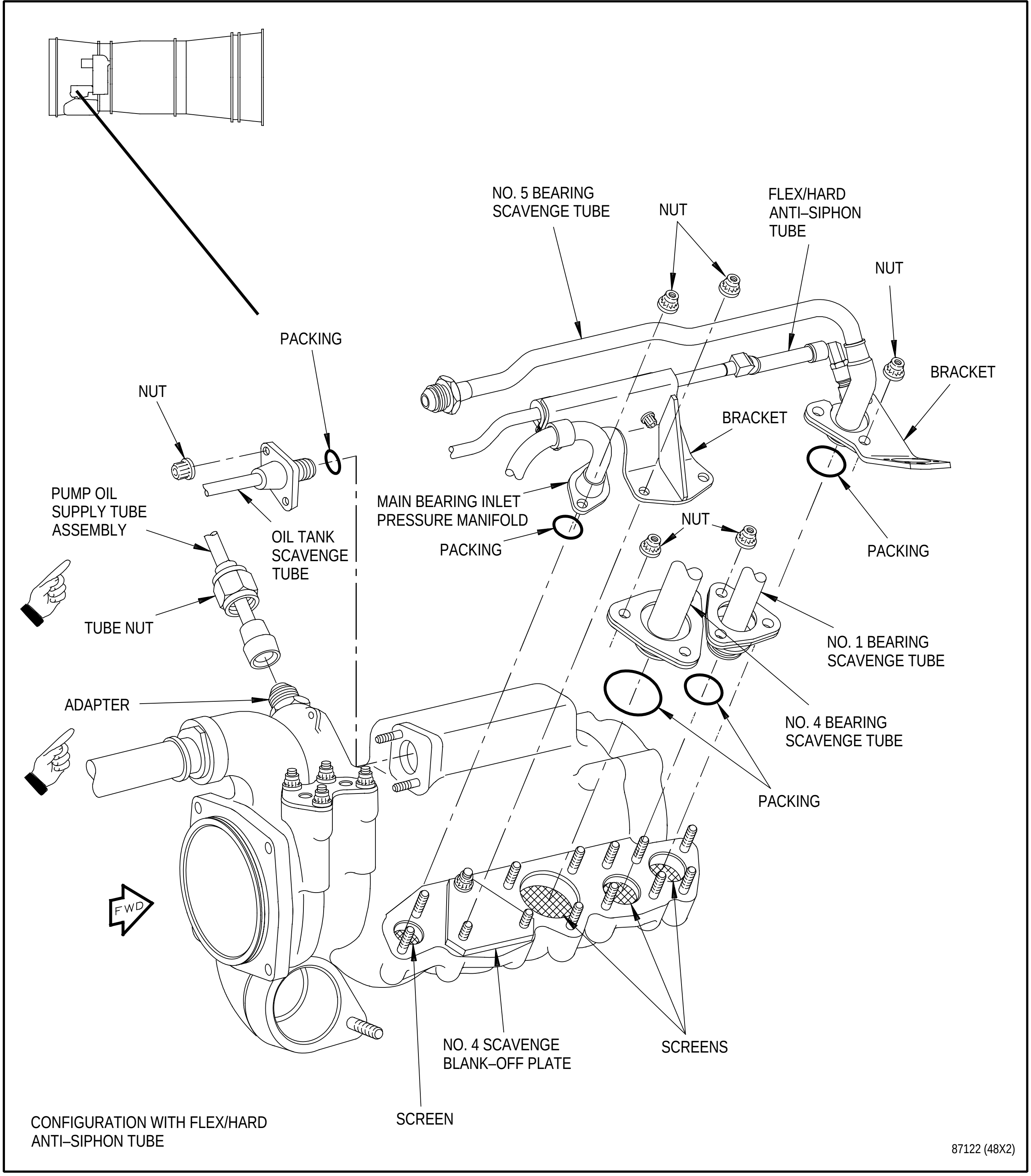


Figure 1A. Main Oil Pump Assembly (With Flex/Hard Anti-Siphon Tube) - Removal

4. MAIN PUMP ASSEMBLY (OIL) - CLEANING.

a. Wipe outside of main pump assembly with a clean cloth moistened in P-D-680, Type II petroleum solvent.

b. Dry with a clean, lint-free cloth.

c. Clean metal chip detectors. Refer to WP 033 00.

d. Remove No. 1, 4, and 5 bearing scavenge tube screens. Clean with P-D-680, Type III petroleum solvent

e. Replace No. 1, 4, and 5 bearing scavenge tube screens.

5. MAIN PUMP ASSEMBLY (OIL) - INSPECTION.

a. Perform visual examination of main pump assembly external surfaces, visible gears, sealing surfaces, threads, and fittings. Replace pump having indications of need for repair.

b. Check rotation of internal parts as follows:

(1) Install PWA 55419 adapter and torque screwdriver on spline of main oil pump.

(2) Apply torque not to exceed two pound-inches maximum to main splined driveshaft. Pump gears shall rotate freely. If they do not, replace pump assembly.

(3) Check splines after torque check to ensure they have not been damaged. If they are damaged, replace pump assembly.

6. MAIN OIL PUMP ASSEMBLY - INSTALLATION.
(See Figures 2 and 3.)

a. Lubricate two PN ST1000-214 packings with a light coat of MIL-L-7808 oil or VV-P-236 petrolatum.

b. Install packings on transfer tube. (See figure 2, Sheet 1.) Install transfer tube in port of main pump assembly.

c. Lubricate PN ST1000-153 packing with a light coat of MIL-L-7808 oil or VV-P-236 petrolatum. Install packing in groove of gearbox mating flange.

d. Before installing pump ensure No. 2 and 3 bearing scavenge pump is installed on front of main gearbox.

e. Put a light coat of PWA 550 antigalling compound on studs of main gearbox pad where pump is mounted.

CAUTION

Failure to align pump with main gearbox may cause damage to splines.

f. Position pump in place on main gearbox pad, aligning splines of pump with splines of No. 2 and 3 bearing scavenge pump, and transfer tube of pump with port on gearbox. Splines of No. 2 and 3 bearing scavenge pump can be aligned with splines in pump by turning gearbox drive spur bevel gearshaft in front face of gearbox with open end wrench on hex of shaft.

g. Install washers and nuts to fasten pump to mating flange of gearbox. Torque nuts 54 to 60 pound-inches.

h. Coat threads of dowel bolts with MIL-L-7808 oil. Install PN 171752 key washers on dowel bolts. Insert dowel bolts into front face of pump. Torque bolts 85 to 95 pound-inches. Bend tabs of key washers against flat of boltheads. Gap between tab and bolthead shall not exceed 0.020 inch.

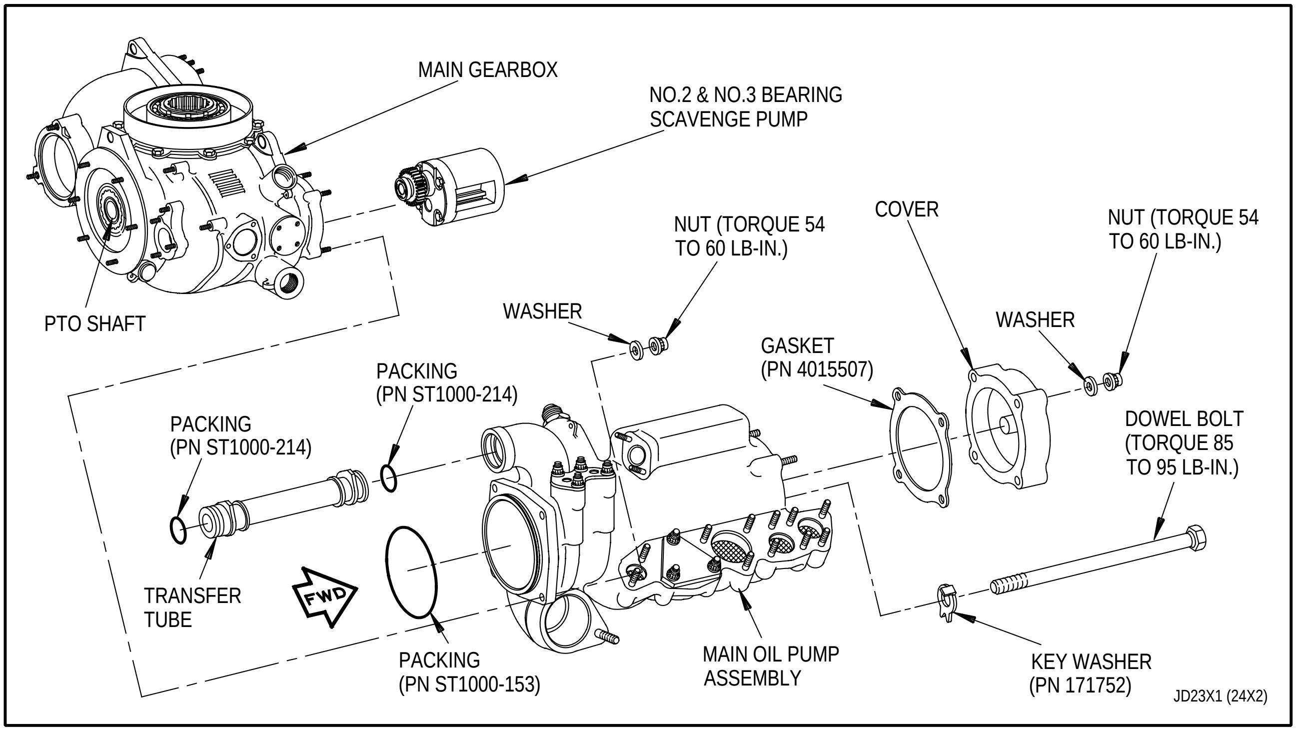


Figure 2. Main Oil Pump Assembly (Without Flex/Hard Anti-Siphon Tube) - Installation (Sheet 1 of 2)

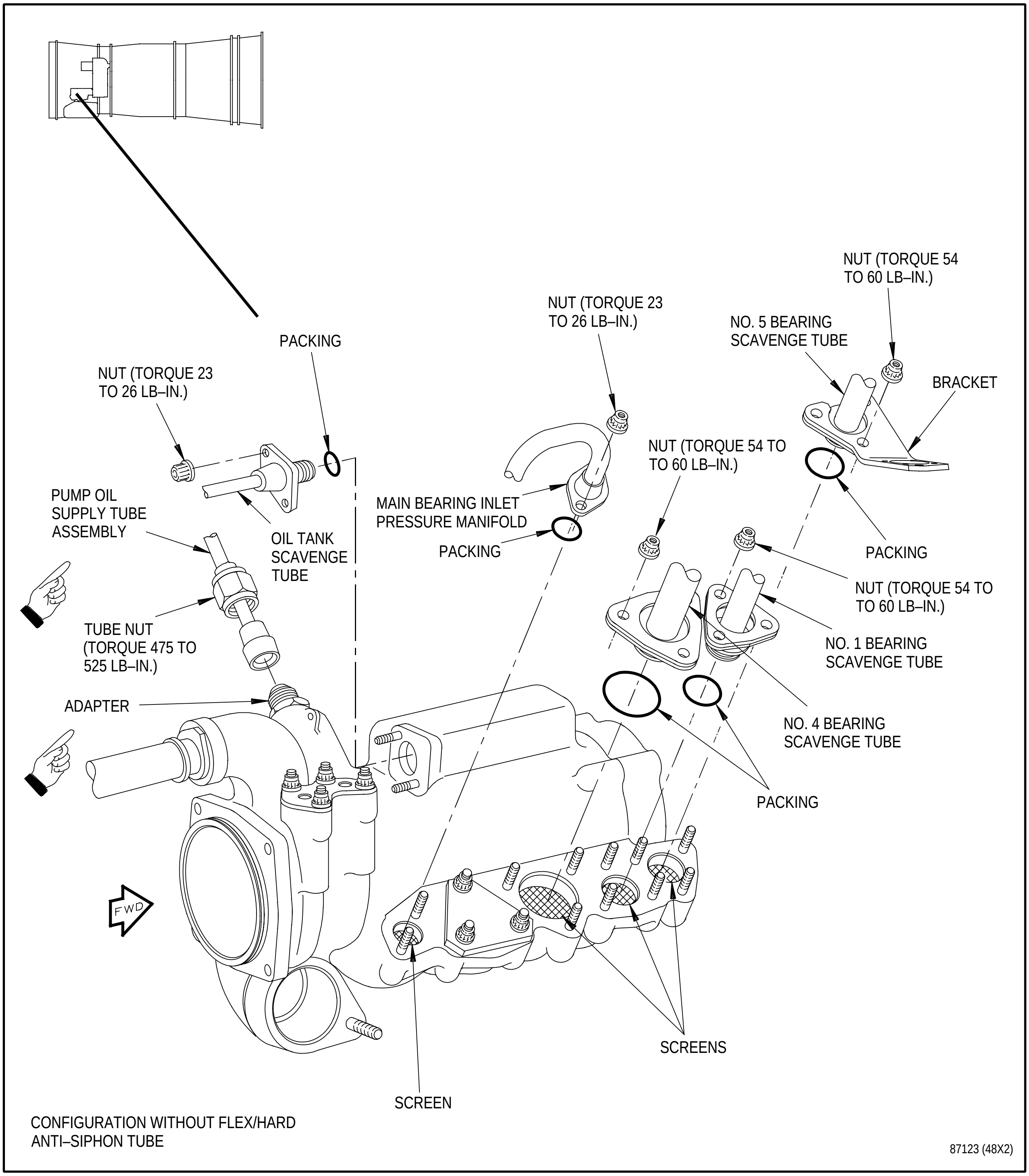


Figure 2. Main Oil Pump Assembly (Without Flex/Hard Anti-Siphon Tube) - Installation (Sheet 2 of 2)

i. Put a light coat of PWA 550 antigalling compound on studs in front face of pump. Install PN 4015507 gasket over studs.

j. Position cover in place and install washers and nuts. Torque nuts 54 to 60 pound-inches.

k. Lubricate the following packings with MIL-L-7808 oil or VV-P-236 petrolatum:

- one PN AS3209-116
- one PN AS3209-218
- one PN AS3209-016
- one PN ST1050-10
- one PN ST1050-016

l. Put a light coat of PWA 550 antigalling compound on tube mounting studs and adapter threads. (See figure 2, Sheet 2.)

m. Ensure wire mesh screens are present in No. 1, 4, and 5 scavenge and main bearing inlet ports before installing tubes.

n. Remove protective closure from No. 1 bearing scavenge tube. Install PN ST1050-10 packing in groove of tube. Position tube in place on side of pump and install nuts. Torque nuts 54 to 60 pound-inches.

o. Remove protective closure from No. 4 bearing scavenge tube. Install PN AS3209-218 packing in groove of tube. Position tube in place on side of pump and install nuts. Torque nuts 54 to 60 pound-inches.

p. Remove protective closure from No. 5 bearing scavenge tube. Install PN ST1050-10 packing in groove of tube. Position bracket and tube in place on side of pump and install nuts. Torque nuts 54 to 60 pound-inches.

q. Install pump oil supply tube as follows:

(1) Prepare tube as follows:

(a) Remove protective closure from tube.

(b) Retract tube nut from tube conical ferrule. Clean tube ferrule, giving attention to inner conical sealing surface, with clean, lint-free cloth moistened with isopropyl alcohol.

(c) Apply thin, even coat of PWA 550 antigalling compound to rear OD taper of tube ferrule and interior of tube nut. Allow antigalling compound to air dry a minimum of 30 minutes.

(2) Install tube on adapter, on upper part of main oil pump, handtight.

(3) If previously loosened or removed, install loop clamps on tube and speed and power cable, and torque clamp bolt 27 to 20 pound-inches. Refer to T.O. 2J-F100-53-5, WP 064 00.

CAUTION

Tube adapter torque is higher than tube nut torque; do not use backup wrench when torquing tube nut. Adapter may loosen and result in oil leak.

(4) Torque tube nut 475 to 525 pound-inches. Do not use backup wrench on adapter while torquing tube nut.

(5) Ensure adequate clearance exists between tube and AP-1 borescope plug.

(6) Lockwire tube nut to adapter using MS9226-04 lockwire.

NOTE

Engine configuration with flex/hard anti-siphon tube incorporates a bracket over No. 4 scavenge blank-off plate which secures main bearing inlet pressure manifold and anti-siphon tube.

r. If present, position bracket over No. 4 scavenge blank-off plate. (See figure 3.) Install nuts and torque 55 to 60 pound-inches.

s. Remove protective closure from oil tank scavenge tube. Install PN ST1050-016 packing in groves of tube. Position tube in place on top of pump. Install nuts. Torque nuts 23 to 26 pound-inches.

t. Remove protective closure from main bearing outlet pressure manifold. Position manifold in place on adapter. Torque tube nut 475 to 525 pound-inches. Lockwire tube nut to adapter with MS9226-04 lockwire.

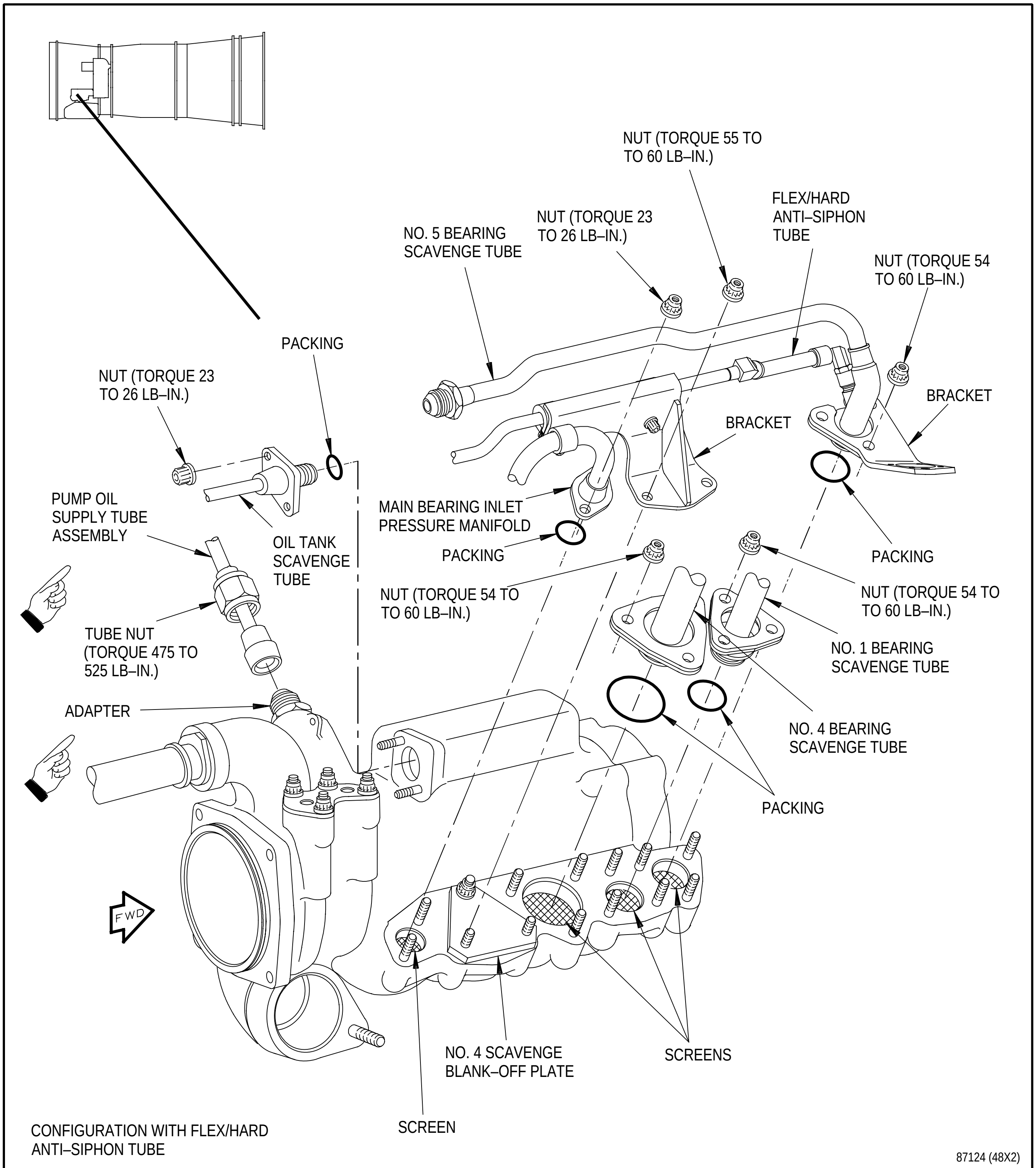


Figure 3. Main Oil Pump Assembly (With Flex/Hard Anti-Siphon Tube) - Installation

7. FOLLOW-ON MAINTENANCE.

a. Install oil tank per WP 031 00.

8. MAIN PUMP ASSEMBLY (OIL) - STORAGE AND SHIPMENT.

NOTE

Preservation is required when a unit is returned to depot or stored for more than 30 days. Units being returned for tear down investigation will be preserved, unless the Service Report disposition instructions advise otherwise.

a. Fill all ports with MIL-L-7808 oil and rotate main pump assembly by hand. Drain excess oil from all ports. Install protective closures.

b. Wrap pump in MIL-B-121, Type II, Grade A, Class 1 barrier material. Place in plastic bag and heat seal.

c. If pump is to be transported, place sealed unit in sturdy cardboard box. Package box and seal with cloth backed masking tape.

WORK PACKAGE

TECHNICAL PROCEDURES

DETECTOR - METAL CHIP, OIL SUMP

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 12

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 11	0				
12 Blank	0				

REFERENCE MATERIAL REQUIRED

Title	Number
Engine Test	T.O. 2J-F100-11-2
JOAP Wearmetal Guidelines	WP 303 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Lockwire (0.032 inch diameter)	MS9226-04
Lockwire (0.040 inch diameter)	MS9226-05
Oil, lubricating,	MIL-L-7808 or
Petrolatum, (alternate to oil)	VV-P-236
Paper, fine filter	-
Solvent, petroleum	P-D-680, Type II

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Packing, preformed	NAS-1593-012	8
Packing, preformed	ST1001-10	4
Packing, preformed	ST1051-08	1

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
2	Oil Sump Metal Chip Detector - Removal	
	Cap - Drain, lubricating oil tank	PWA 51192

ILLUSTRATED SUPPORT EQUIPMENT

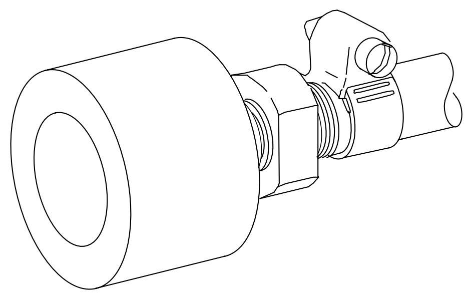


Figure T1. PWA 51192 Drain Cap

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures for the oil sump metal chip detector:

- Removal
- Cleaning
- Inspection
- Installation

2. OIL SUMP METAL CHIP DETECTOR - REMOVAL.

(See Figure 1.)

CAUTION

Do not handle magnetic end of chip detectors. Metal particles clinging to chip detector may be knocked off before chip detector can be inspected.

NOTE

There are four oil sump metal chip detectors; three are located in the main oil pump and one is in the main gearbox.

a. Push in plug grip of chip detector and turn counterclockwise. (See figure 1, Sheet 1.) Remove metal chip detector and packing. Discard packing.

NOTE

- Check valve portion of metal chip detector need not be removed, unless it is to be cleaned, inspected, or replaced.
- Oil tank and main gearbox shall be drained if check valve is to be removed.

b. Place bucket under drain cap of oil tank and chip detector in right side of gearbox. (See figure 1, Sheet 2.)

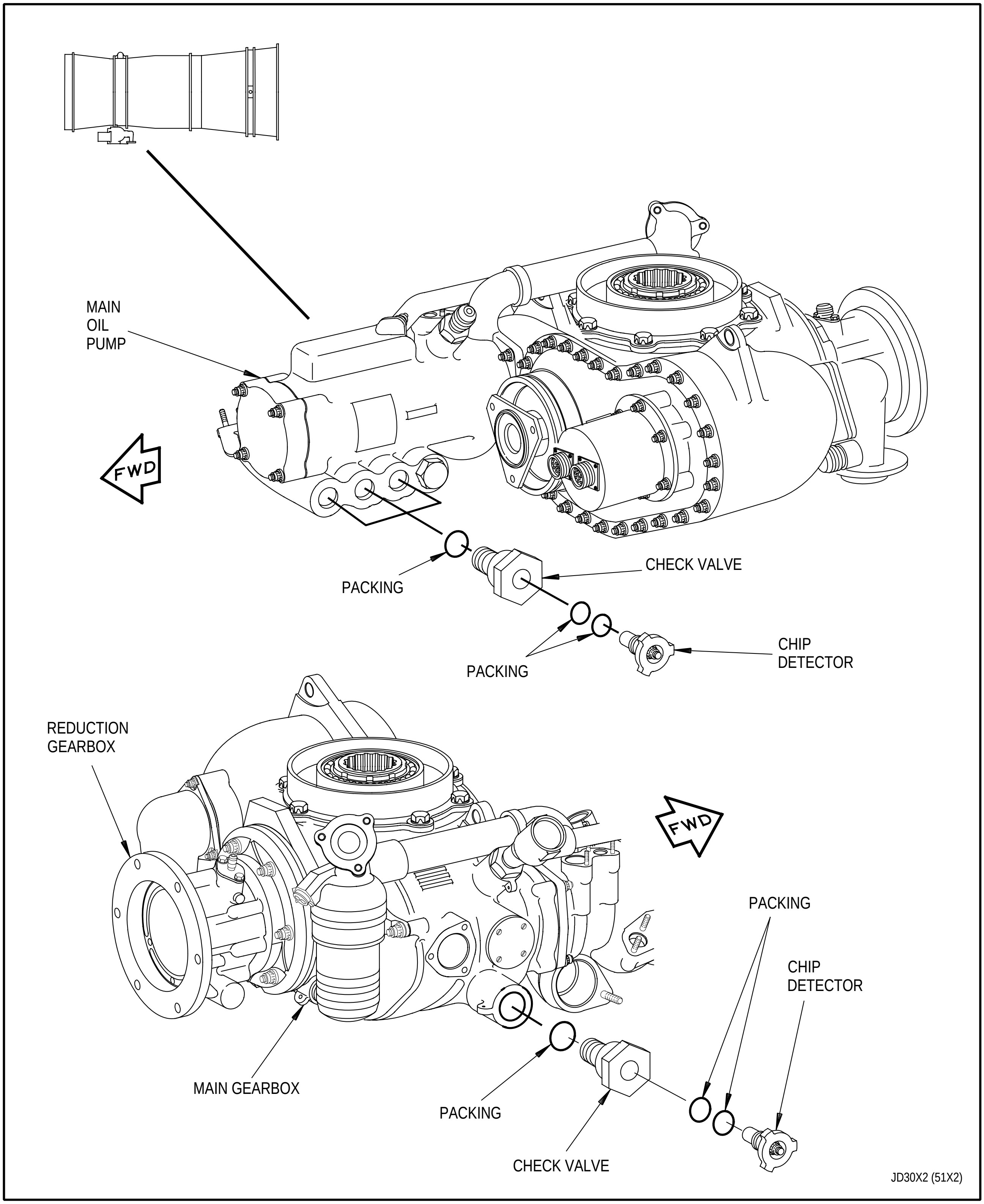


Figure 1. Metal Chip Detector Assembly - Removal (Sheet 1 of 2)

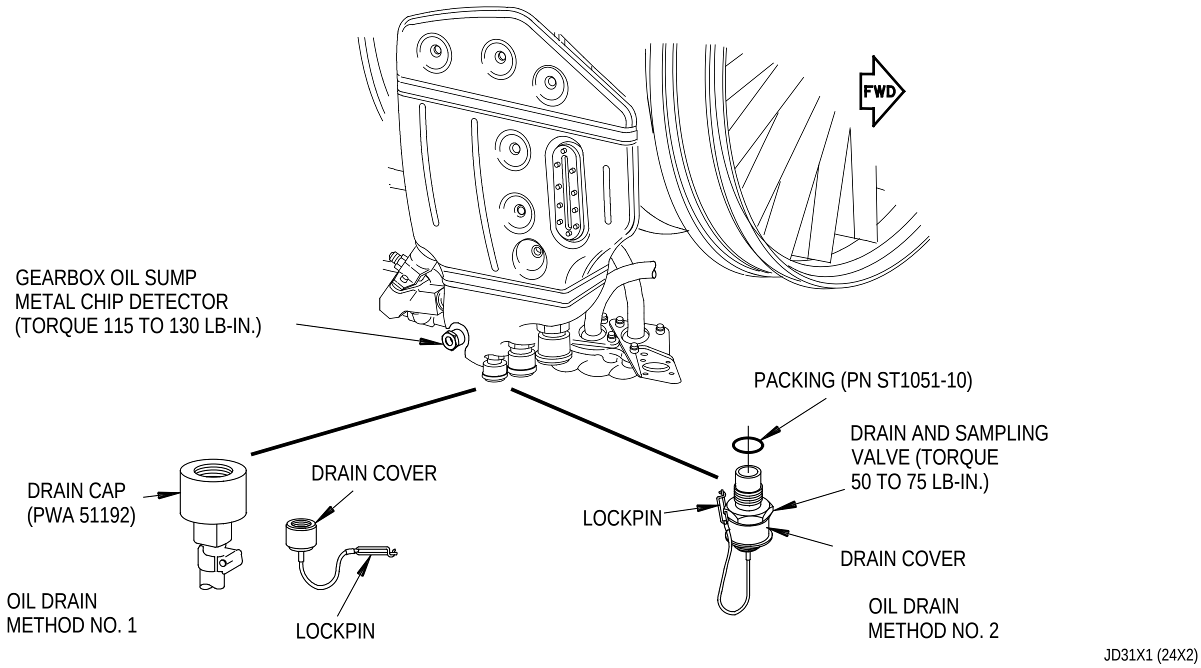


Figure 1. Metal Chip Detector Assembly - Removal (Sheet 2 of 2)

c. Drain residual oil from oil tank using one of the following two methods:

(1) Drain oil through drain and sampling valve (figure 1) as follows:

(a) Remove cover from oil tank drain and sampling valve.

(b) Install PWA 51192 drain cap on oil tank drain and sampling valve.

(c) Allow oil to drain from tank.

(d) Remove PWA 51192 drain cap and install drain cover.

(2) Drain oil by removing drain and sampling valve (figure 1) as follows:

CAUTION

Support valve housing boss of oil tank with wrench when removing valve to prevent possible damage to oil tank.

(a) Remove drain and sampling valve from oil tank, and discard packing.

(b) Allow oil to drain from tank.

(c) Lubricate PN ST1051-10 packing and threads of drain and sampling valve with a light coat of MIL-L-7808 oil or VV-P-236 petrolatum.

(d) Install packing on valve, and install valve in port of lower oil tank boss.

(e) Torque valve 50 to 75 pound-inches.

(f) Lockwire valve with PN MS9226-05 wire.

d. Remove chip detector and check valve from main gearbox and allow oil to drain into 5 gallon container.

e. Remove check valves and packings from main gearbox and pump. Discard packings.

f. Place protective closures in main gearbox and pump, as required.

3. OIL SUMP METAL CHIP DETECTOR - CLEANING.

a. Chip detector shall be inspected for metal particles before cleaning. If metal particles are indicated, cleaning solvent and rinse water shall be filtered through fine paper filter and brushing of chip detector shall be done over clean paper. Metal particles removed from chip detectors shall be saved for further inspection and analysis. Refer to paragraph 4.

b. Wash chip detector with P-D-680, Type II petroleum solvent. Filter solvent used through fine filter paper. Save any metal particles left on paper for inspection.

c. Rinse chip detector in clear water. Filter water used through fine filter paper. Save any metal particles left on paper for inspection. Dry detector with low pressure filtered air at less than 30 psig.

d. Ensure magnetic end of chip detector is free of metal flakes, metal chips, or metal fuzz. Use small bristled brush, or piece of masking tape to remove stubborn metal material. Save any flakes, chips, or fuzz removed for inspection.

e. Repeat steps b. and c.

f. Wash check valve with P-D-680, Type II petroleum solvent.

g. Rinse check valve in clear water. Dry valve with low pressure filtered air at less than 30 psig.

4. OIL SUMP METAL CHIP DETECTOR - INSPECTION.

a. Metal particles removed from oil sump metal chip detector shall be inspected. Refer to T.O. 2J-F100-11-2, WP 303 00.

b. Visually inspect chip detector for damage. Inspect packing grooves. Grooves shall be capable of seating and retaining packing. Rough edges or burrs may be smoothed out. Replace severely damaged metal chip detectors.

c. Visually inspect check valve for damage. Inspect packing groove. Groove shall be capable of seating and retaining packing. Rough edges or burrs may be smoothed out. Replace chip detector if check valve is damaged.

5. OIL SUMP METAL CHIP DETECTOR - INSTALLATION.
(See Figure 2.)

a. Install check valve(2, figure 2, Sheet 1) portion of chip detector(4) as follows, if removed:

(1) Lubricate PN ST1001-10 packing(1) and threads of check valve(2) with a light coat of MIL-L-7808 oil or VV-P-236 petrolatum.

(2) Install packing(1) in groove of check valve(2).

CAUTION

Ensure check valve is properly lockwired. If not properly lockwired, check valve can become unscrewed during engine operation, resulting in oil loss and damage to engine bearings.

(3) Remove protective closures from access port on lower right side of main gearbox or from access ports on left side of main pump assembly, as required. Install check valve(2). Torque 115 to 130 pound-inches. Lockwire check valve with PN MS9226-04 wire.

b. Lubricate two PN NAS-1593-012 packings(3) with a light coat of MIL-L-7808 oil, or VV-P-236 petrolatum.

(1) Install packings(3) in grooves of metal chip detectors(4).

CAUTION

Ensure chip detector is properly installed in positive locked position. (See figure 2, Sheet 2.) Improper installation can cause chip detector to fall out during engine operation, resulting in oil loss and damage to engine bearings.

c. Install metal chip detector(4, figure 2, Sheet 1) in check valves(2) of main gearbox or pump as follows:

(1) Align three lugs of chip detector(4) with three slots in check valve(2).

(2) Depress chip detector(4) into check valve(2) and turn clockwise. Release detector.

(3) Align plug grip of chip detector(4) with hex points to put chip detector in its positive locked position. (See figure 2, Sheet 2.)

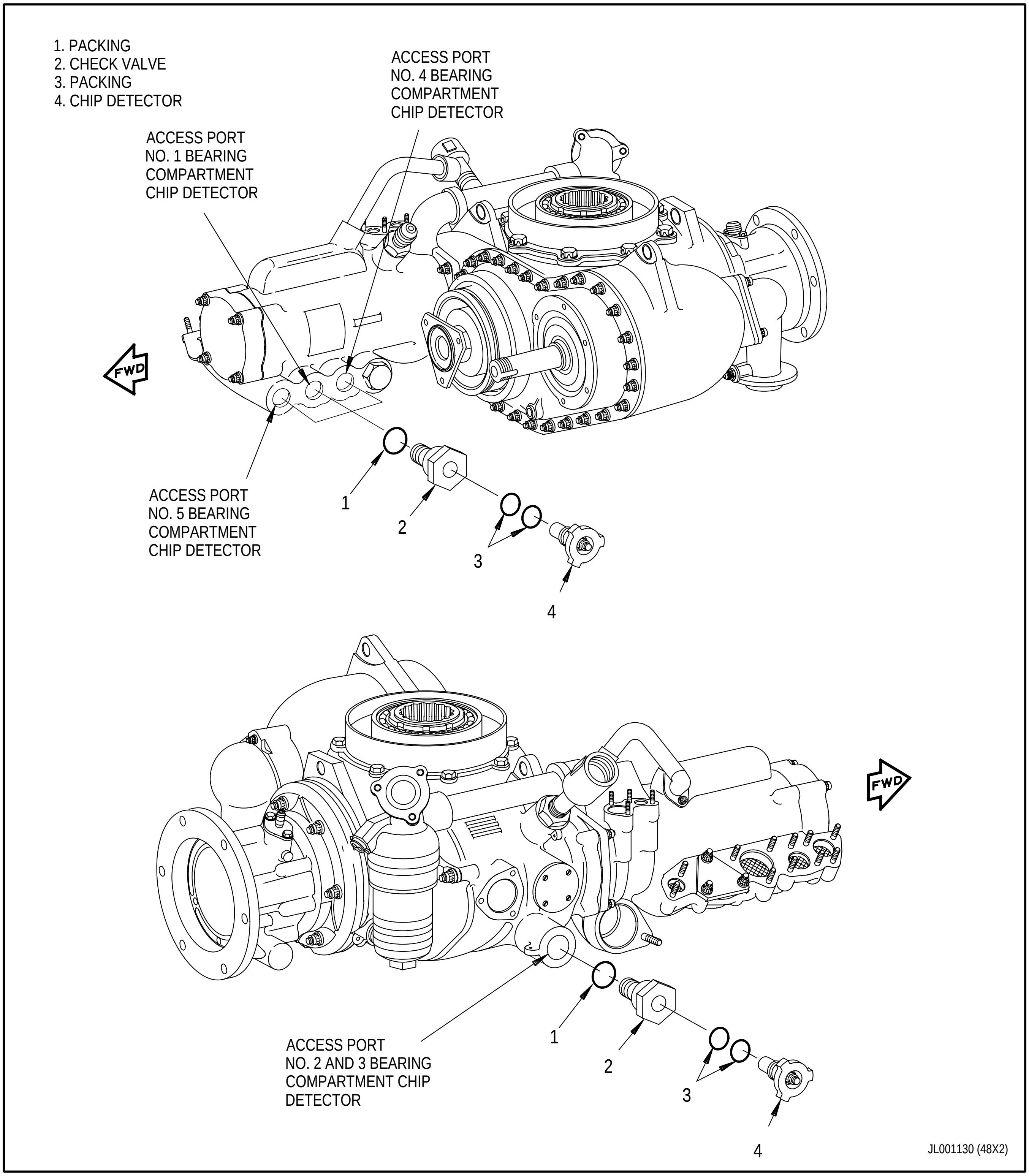


Figure 2. Metal Chip Detector Assembly - Installation (Sheet 1 of 2)

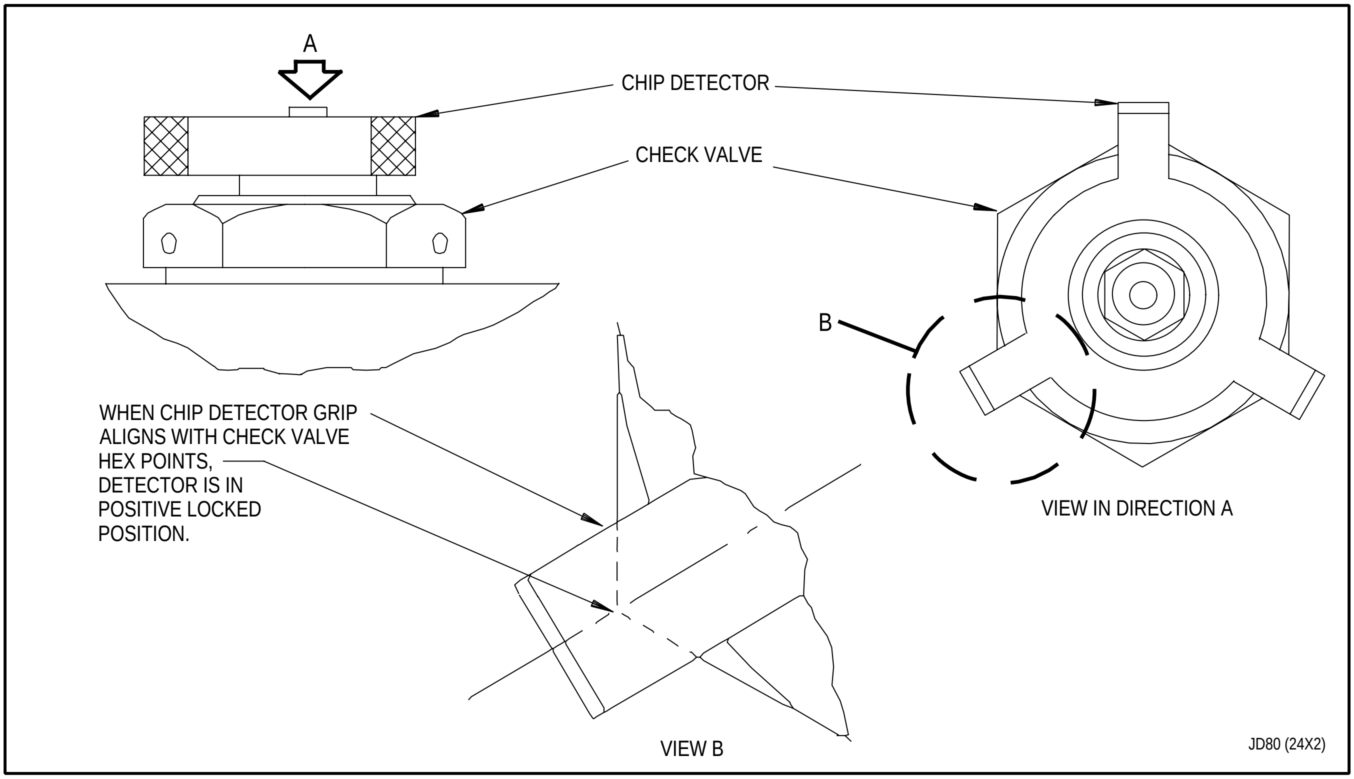


Figure 2. Metal Chip Detector Assembly - Installation (Sheet 2 of 2)

WORK PACKAGE

TECHNICAL PROCEDURES

CYLINDER - ACTUATING, LINEAR, VARIABLE VANE, REAR COMPRESSOR

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 18

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2	28	9	26	15	2
3	20	10 - 11	7	16	0
4 - 5	0	12	0	17	5
6 - 7	5	13 - 14	7	18	0
8	0				

REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information	T.O. 2J-F100-53-1
General Procedures	WP 021 00
Engine Accessories and Rigging Procedures	T.O. 2J-F100-53-4
Cylinders, Actuating, Linear, Variable Vane, Rear Compressor - Rigging	WP 101 00
Hydraulic Pressure Tester PWA 50096	T.O. 33D4-6-617-1

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
	LOCKWIRE
0.032 INCH DIAMETER	MS9226-04
CLOTH, LINT-FREE	-
COMPOUND, ANTIGALLING (PWA 36545)	ESNALUBE 382
COMPOUND, ANTIGALLING (PWA 550)	HI-T-650 OR LUBRI-BOND HT
OIL, LUBRICATING	MIL-L-6081, GRADE 1010
OIL, LUBRICATING	MIL-L-7808 OR
PETROLATUM (ALTERNATE TO OIL)	VV-P-236
SOLVENT, PETROLEUM	P-D-680, TYPE II
TAPE, MASKING (CLOTH BACKING)	MYSTIK 5863 RED

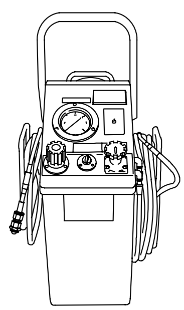
EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
COTTER PIN	MS9245-24	2
KEY WASHER	4004816	2
PACKING, PREFORMED	MS9966-04	4

APPLICABLE SUPPORT EQUIPMENT

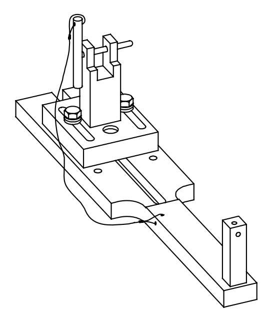
Paragraph	Function - Tool Nomenclature	Tool Number
3	Rear Compressor Variable Vane Linear Actuating Cylinder - Removal of Attaching Parts	
	Fixture - Positioning, Variable Vane Actuator - - - -	PWA 57489
6	Rear Compressor Variable Vane Linear Actuating Cylinder - Installation of Attaching Parts	
	Fixture - Positioning, Variable Vane Actuator - - - -	PWA 57489
8	Rear Compressor Variable Vane Linear Actuating Cylinder - Storage and Shipment	
	Tester - Hydraulic Pressure - - - - - - - - - - - - - - - -	PWA 50096

ILLUSTRATED SUPPORT EQUIPMENT



PWA 50096 –C

Figure T1. PWA 50096 Tester



PWA 57489 –C

Figure T2. PWA 57489 Fixture

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures for the rear compressor variable vane (RCVV) linear actuating cylinder:

- Removal
- Removal of attaching parts
- Cleaning
- Inspection
- Installation of attaching parts
- Installation
- Storage and shipment

2. REAR COMPRESSOR VARIABLE VANE LINEAR ACTUATING CYLINDER - REMOVAL.

(See Figure 1.)

NOTE

This procedure applies to rear compressor linear actuating cylinder on right and left hand sides of engine.

a. Disconnect compressor cylinder rear extend and retract manifolds from actuating cylinder. Install protective closures.

b. Disconnect electrical cable connector from actuating cylinder. Install protective closures.

c. Remove cotter pin, nut, and bolt securing actuating cylinder clevis to compressor stator linkage arm. Discard cotter pin.

WARNING

Jet fuel may be expelled from the actuator if the cylinder rod is moved while the manifold tubes are disconnected.

d. Remove cotter pin, nut, and bolt holding cylinder to support. Remove cylinder. Discard cotter pin.

e. Remove actuating cylinder from other side of engine. Refer to steps a. through e.

f. Check both cylinders for evidence of leakage around cylinder rod. If evidence of leakage is found, replace cylinder.

g. Purge fuel from actuating cylinder.

h. Install protective closures on electrical connections and plumbing connections.

i. Make notation on tag identifying fixture by RCVV and engine serial numbers. Fixture is not to be reset until cylinder has been adjusted. Tag fixture.

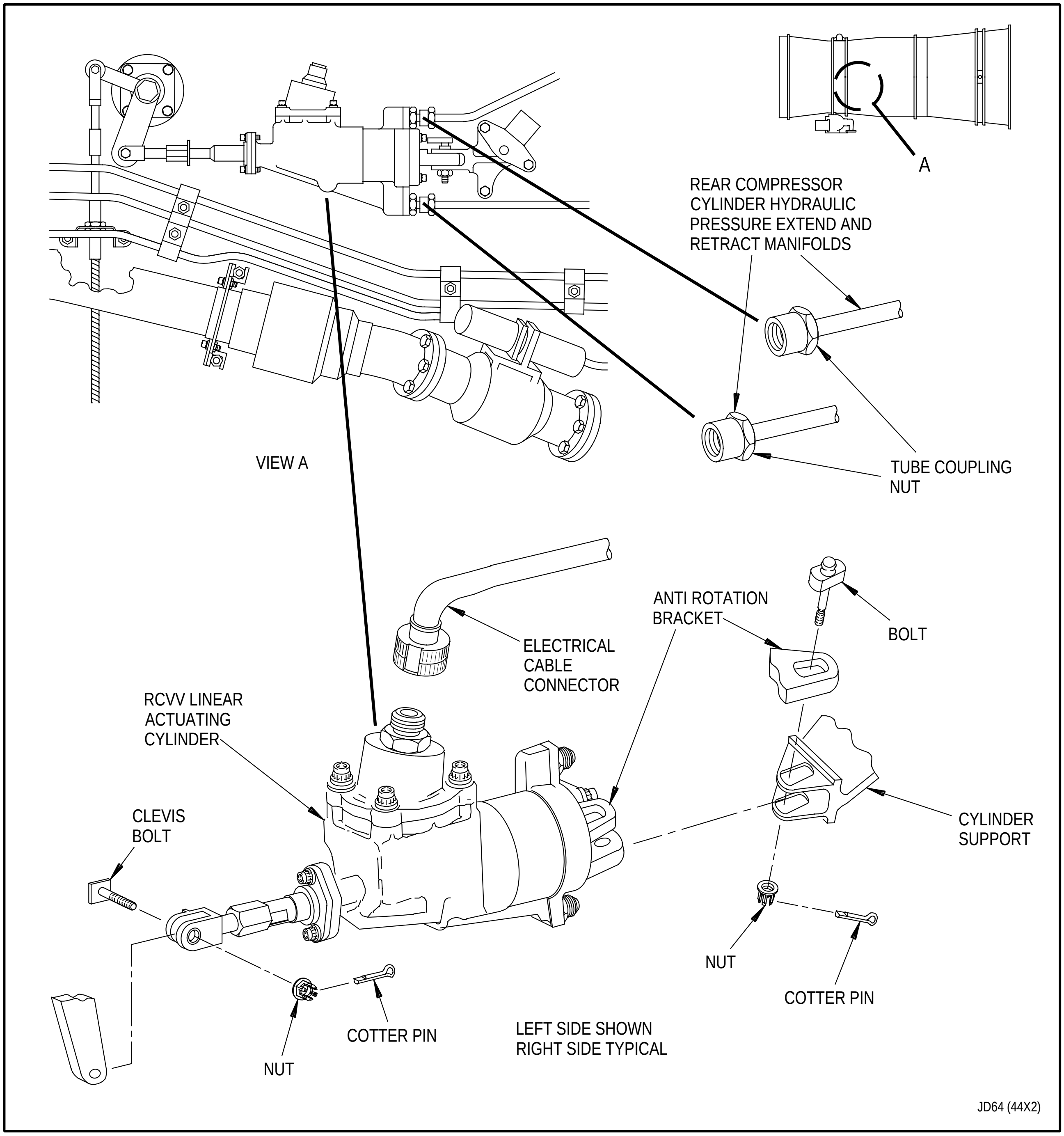


Figure 1. Rear Compressor Variable Vane Linear Actuating Cylinder - Removal

3. REAR COMPRESSOR VARIABLE VANE LINEAR ACTUATING CYLINDER - REMOVAL OF ATTACHING PARTS.
(See Figure 2.)

NOTE

Linear actuating cylinder is rigged to engine actuating synchronizing ring of engine from which it was removed. Index retracted length of cylinder, using specified fixture, before disassembling.

a. Loosen bolts on PWA 57489 fixture. Remove T-pin from fixture yoke.

WARNING

Jet fuel may be expelled from the actuator if the cylinder rod is moved while the manifold tubes are disconnected.

b. Push cylinder rod into cylinder as far as it will go.

c. Place cylinder rear mounting lug on dowel pin of fixture.

d. Position rod end clevis of cylinder in yoke of fixture. Move yoke pad, as required, until T-pin can be inserted through yoke and clevis smoothly.

e. Lock pad in place by tightening bolts.

f. Make notation on tag identifying fixture by RCVV and engine serial number. Fixture is not to be reset until cylinder has been adjusted. Tag fixture.

g. Remove T-pin from yoke and remove cylinder from fixture. Replace T-pin in yoke.

NOTE

Cylinder may be clamped in a soft jawed vise for ease of removing adapters.

h. Remove adapters and packings from cylinder. Install protective closures in ports and discard packings.

i. Remove rod end clevis, sleeve nut, and key washer from cylinder. Discard key washer.

j. Retain sleeve nut and clevis.

k. Refer to paragraph 8 for storage and shipment.

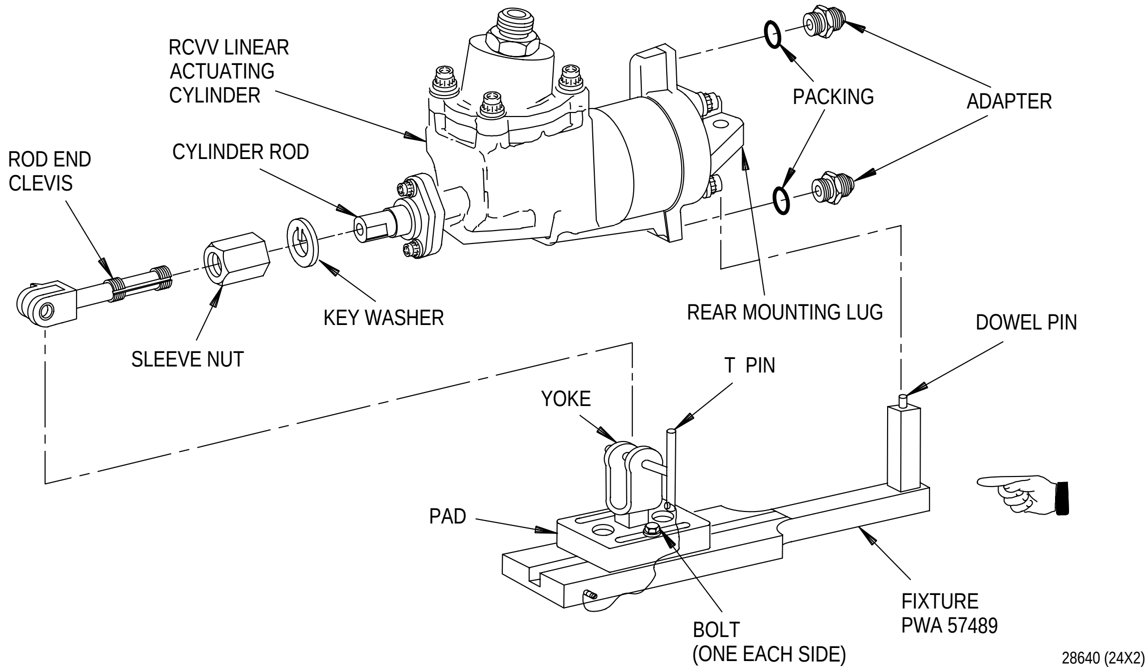


Figure 2. Rear Compressor Variable Vane Linear Actuating Cylinder - Removal of Attaching Parts

4. REAR COMPRESSOR VARIABLE VANE LINEAR ACTUATING CYLINDER - CLEANING.

a. Using a clean cloth moistened with P-D-680, Type II petroleum solvent, wipe exterior of linear actuating cylinder.

b. Wipe cylinder dry with a clean, dry lint-free cloth.

5. REAR COMPRESSOR VARIABLE VANE LINEAR ACTUATING CYLINDER - INSPECTION.

(See Figure 3.)

WARNING

Jet fuel may be expelled from the actuator if the cylinder rod is moved while the manifold tubes are disconnected.

a. Place cylinder in vise having soft jaws with cylinder rod up and check cylinder travel with depth micrometer, or equivalent. (See figure 3, sheet 1.)

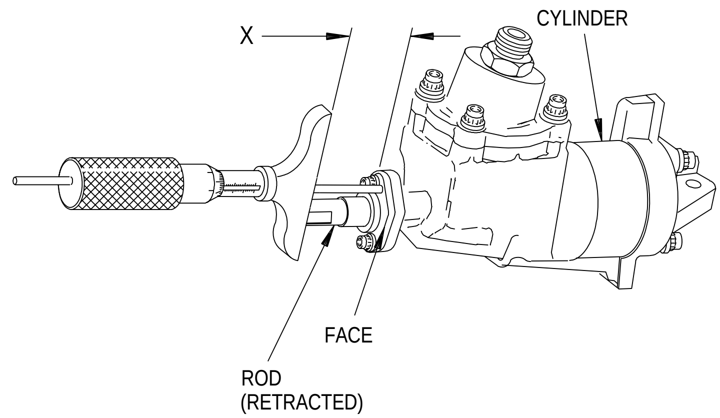
(1) Replace actuating cylinder if cylinder rod binds at any point of travel.

b. Inspect actuating cylinder and attaching parts. (See figure 3, sheet 2.)

c. Inspect electrical connector. Refer to T.O. 2J-F100-53-1, WP 021 00.

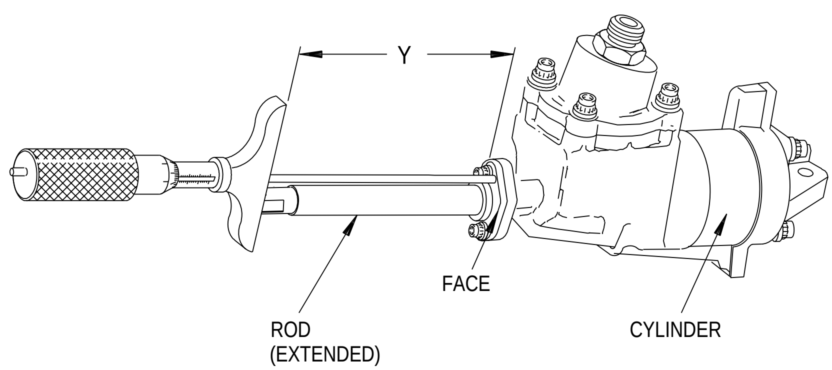
a. ACTUATE CYLINDER TO FULL RETRACT POSITION.

b. MEASURE DISTANCE FROM END OF ROD TO FACE OF CYLINDER. RECORD DIMENSION X.



c. ACTUATE CYLINDER TO FULL EXTEND POSITION

d. MEASURE DISTANCE FROM END OF ROD TO FACE OF CYLINDER. RECORD DIMENSION Y.



e. SUBTRACT DIMENSION X FROM DIMENSION Y TO OBTAIN CYLINDER STROKE. IF STROKE IS WITHIN ACCEPTABLE STROKE LIMITS, CYLINDER IS SERVICEABLE. IF STROKE IS NOT WITHIN ACCEPTABLE STROKE LIMITS, REPLACE CYLINDER.

ACTUATING CYLINDER PN	ACCEPTABLE STROKE LIMITS
441293	1.286 TO 1.334
441720	1.180 TO 1.220

NOTE

ALL DIMENSIONS IN INCHES
UNLESS OTHERWISE SPECIFIED

104577 (48X2)

Figure 3. Rear Compressor Variable Vane Linear Actuating Cylinder - Inspection (Sheet 1 of 2)

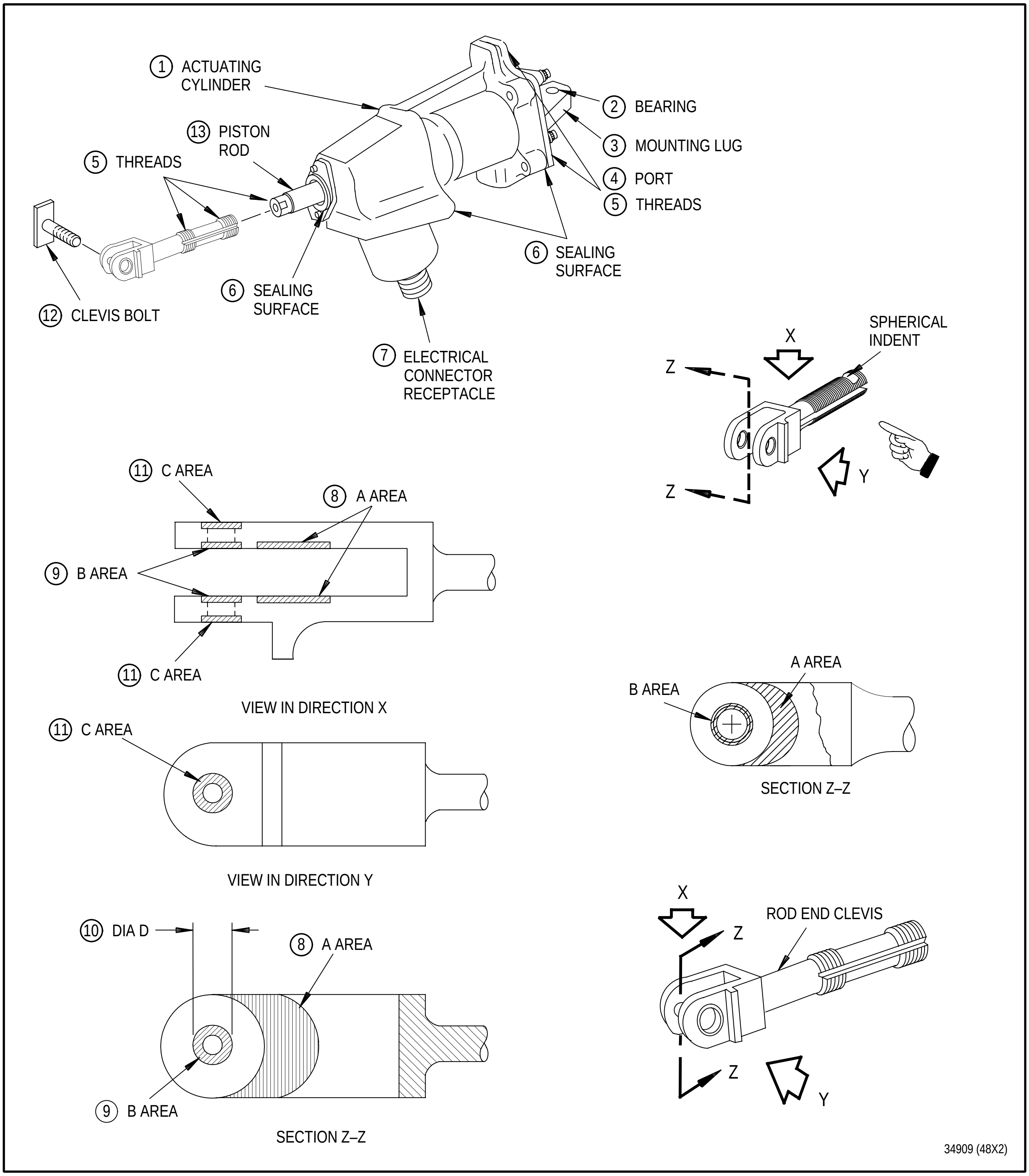


Figure 3. Rear Compressor Variable Vane Linear Actuating Cylinder - Inspection (Sheet 2 of 2)

Legend for figure 3

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Actuating cylinder -			
Surface dents or cracks	Not serviceable	Not reparable	Replace RCVV linear actuating cylinder.
Threaded hole damage	Not serviceable	Not reparable	Replace RCVV linear actuating cylinder.
2. Bearing -			
Radial and axial tears	Up to 0.010 inch	Not reparable	Replace RCVV linear actuating cylinder.
Damage	Not serviceable	Not reparable	Replace RCVV linear actuating cylinder.
3. Mounting lug -			
Damage	Not serviceable	Not reparable	Replace RCVV linear actuating cylinder.
4. Port -			
Contamination	Not serviceable	Not reparable	Replace RCVV linear actuating cylinder.
5. Threads -			
Damage	Not serviceable	Not reparable	Replace RCVV linear actuating cylinder.
Contamination	Not serviceable	See corrective action.	Clean threads.
6. Sealing surface -			
Leakage	Not serviceable	Not reparable	Replace RCVV linear actuating cylinder.
7. Electrical connector receptacle -			
Threads broken or dented	Not serviceable	Not reparable	Replace RCVV linear actuating cylinder.

Legend for figure 3 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
8. A Area -			
Wear	Summation of wear depths not to exceed 0.006 inch (A areas are surfaces which contact linkage arm)	Not reparable	Replace rod end clevis.
9. B Area -			
Wear	Summation of wear depths not to exceed 0.006 inch	Not reparable	Replace rod end clevis.
10. Diameter D -			
Wear	Up to 0.006 inch. Diameter not to exceed 0.5100 inch maximum	Not reparable	Replace rod end clevis.
11. C Area -			
Wear	Summation of wear depths not to exceed 0.006 inch	Not reparable	Replace rod end clevis.
12. Clevis bolt -			
Wear	Up to 0.004 inch. 0.2500 inch diameter minimum	Not reparable	Replace clevis bolt.
13. Piston rod -			
Damage	Not serviceable	Not reparable	Replace RCVV linear actuating cylinder.

6. REAR COMPRESSOR VARIABLE VANE LINEAR ACTUATING CYLINDER - INSTALLATION OF ATTACHING PARTS. (See Figure 4.)

a. If required, remove corrosion preventive compound from cylinder by wiping with clean cloth moistened with P-D-680, Type II petroleum solvent.

b. Apply a light coat of PWA 550 antigalling compound to threads of clevis rod end. Remove excess.

c. Install sleeve nut on clevis rod as far as it will go.

NOTE

- First set of threads on end of clevis shall not show beyond end of cylinder rod.
- Full threaded clevis with spherical indent, spherical indent shall not protrude from cylinder rod.

d. Position PN 4004816 key washer on end of cylinder rod with bent tab in slot of rod.

e. Turn clevis into cylinder rod all the way.

f. Index cylinder to match actuating synchronizing ring of engine as follows:

WARNING

Jet fuel may be expelled from the actuator if the cylinder rod is moved while the manifold tubes are disconnected.

NOTE

Ensure linear actuating cylinder matches cylinder that is identified on tag of PWA 57489 fixture used in paragraph 3 of this procedure. If cylinder is a replacement unit, reidentify unit shown on tag of fixture.

(1) Push cylinder rod into cylinder as far as it will go. Cylinder rod shall be in fully retracted position when doing the following steps.

(2) Ensure bolts of fixture are tight so pad cannot be moved. If bolts are loose, proceed to paragraph 7. Remove T-pin from tagged PWA 57489 fixture.

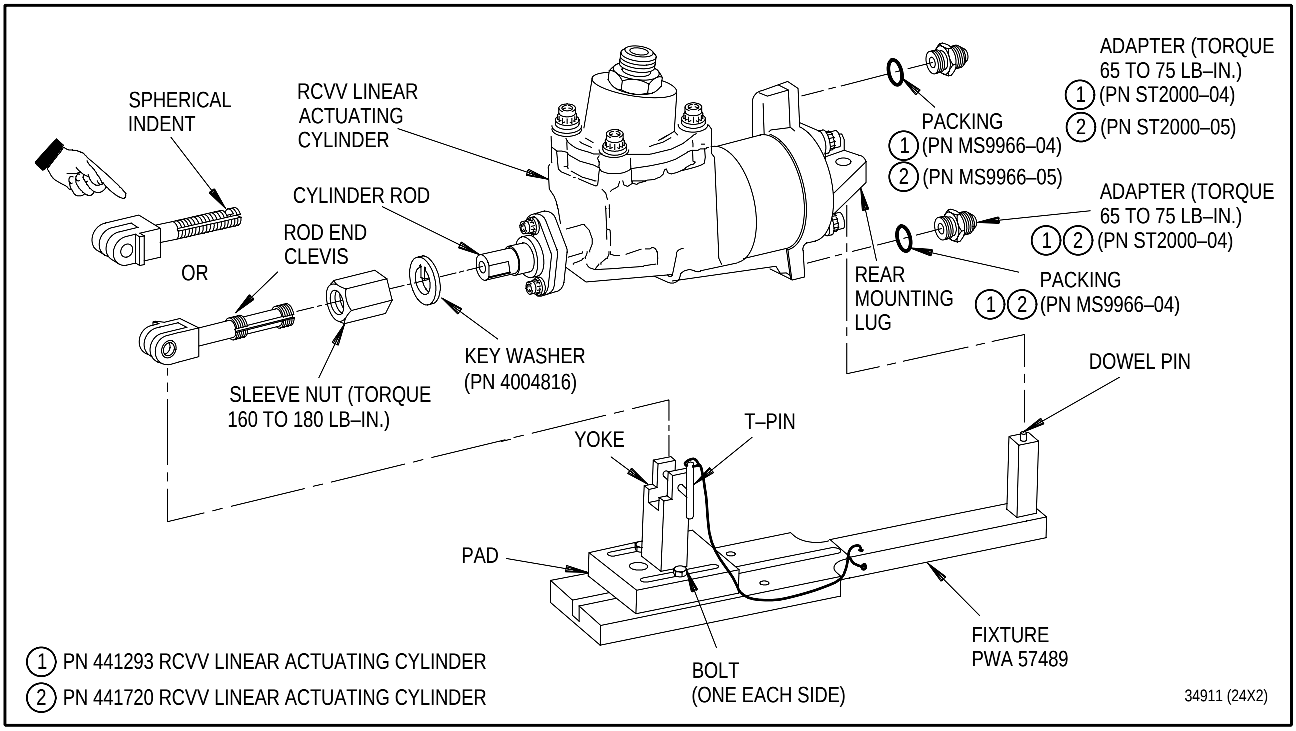


Figure 4. Rear Compressor Variable Vane Linear Actuating Cylinder - Installation of Attaching Parts

(3) Place cylinder rear mounting lug over dowel pin of fixture.

(4) Line up holes in rod end clevis with holes in fixture yoke, by unscrewing rod end clevis, until locking T-pin can be inserted through yoke and clevis smoothly.

NOTE

- Do not bend tabs of key washer at this time. This will be done during rigging.
- Full threaded clevis with spherical indent, spherical indent shall not protrude from cylinder rod.

(5) Turn sleeve nut toward cylinder rod, thread on clevis shall not protrude beyond end of sleeve nut.

(6) Torque sleeve nut 160 to 180 pound-inches.

(7) Remove linear actuating cylinder from fixture. Remove identification tag from fixture. Replace locking pin in yoke of fixture.

NOTE

RCVV actuating cylinder may be clamped in a soft-jawed vise to install adapters.

g. Lubricate packings and adapters with a light coat of MIL-L-7808 lubricating oil or VV-P-236 petrolatum. Install packings on ends of adapters that mate with cylinder.

h. Install PN MS9966-05 packing on PN ST2000-05 adapter on extend port of actuating cylinder. Torque adapters 90 to 100 pound-inches.

i. Install PN MS9966-04 packing on PN ST2000-04 adapter on retract port of actuating cylinder. Torque 65 to 75 pound-inches.

7. REAR COMPRESSOR VARIABLE VANE LINEAR ACTUATING CYLINDER - INSTALLATION.

(See Figure 5.)

NOTE

This procedure applies to rear compressor linear actuating cylinder on right and left hand sides of engine.

a. Position rear mounting lug of cylinder in cylinder support.

b. Put a light coat of PWA 550 antigalling compound on threads of rear mounting lug bolt. Insert bolt through cylinder support and rear mounting lug of cylinder.

c. Install nut and torque to low limit (35 pound-inches). Continue to torque nut to a maximum of 70 pound-inches until cotter pin holes in nut line up with holes in bolt. Install PN MS9245-24 cotter pin.

d. Connect rear compressor cylinder hydraulic pressure extend and retract manifolds to cylinder as follows:

(1) Apply thin coat of PWA 36545 antigalling compound to threads of tube coupling nuts. Remove excess.

(2) Connect manifolds to cylinder:

(a) Connect extend manifold. Ensure that PN MS9966-05 packing is used on adapter. Torque coupling nut 90 to 100 pound-inches.

(b) Connect retract manifold. Ensure that PN MS9966-04 packing is used. Torque coupling nuts 65 to 75 pound-inches.

(3) Lockwire coupling nuts using MS9226-04 wire.

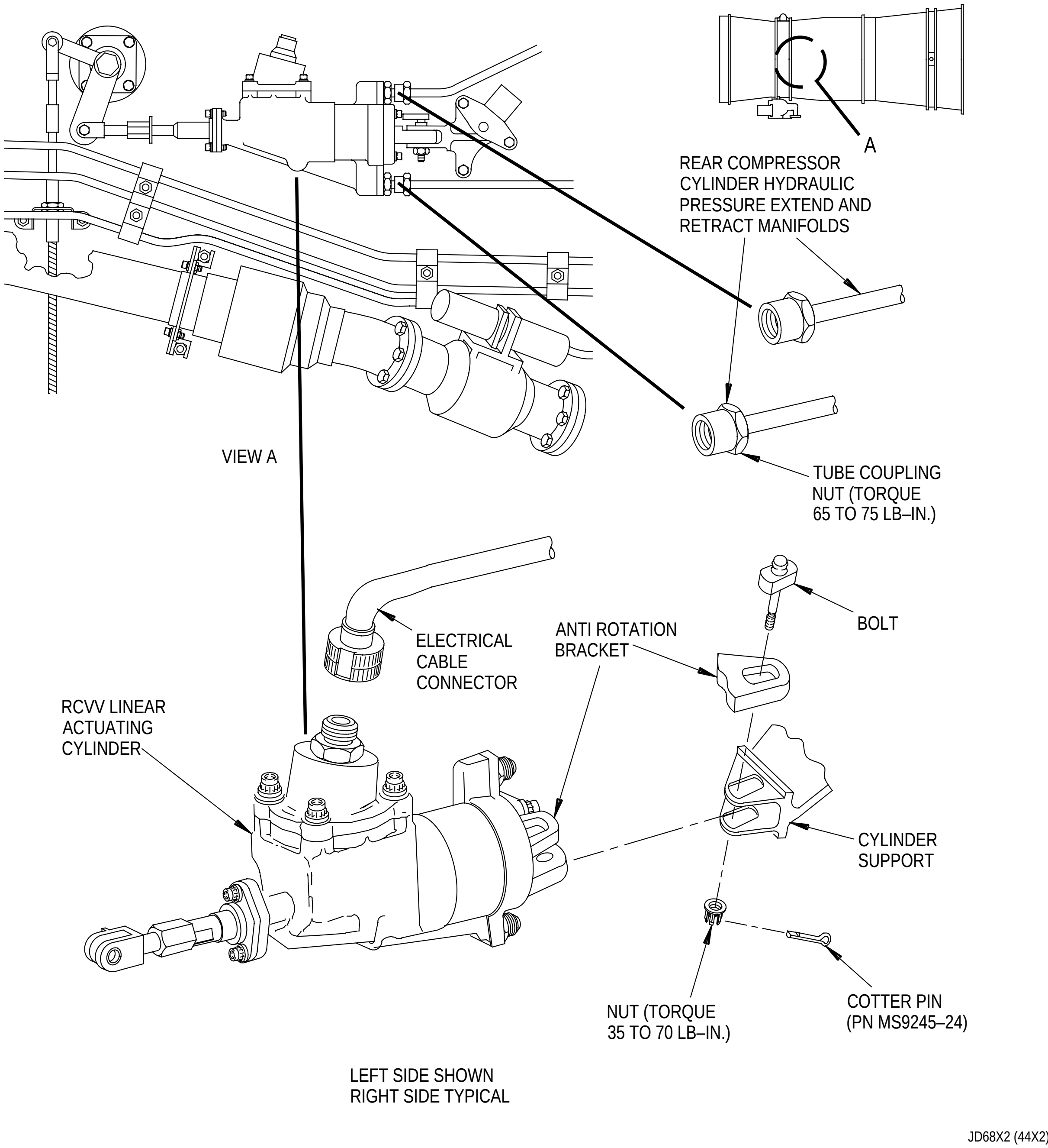


Figure 5. Rear Compressor Variable Vane Linear Actuating Cylinder - Installation

e. Connect electrical cable connector to actuating cylinder as follows:

(1) Align keyways and handtighten connector.

(2) Ensure red line on receptacle is not visible when viewed at right angles.

(3) Tighten connector firmly with soft-jawed pliers.

NOTE

If PWA 57489 fixture was loose in paragraph 6, step f.(2), refer to WP 101 00 for rigging procedures.

f. Rig linear actuating cylinders. Refer to WP 101 00.

8. REAR COMPRESSOR VARIABLE VANE LINEAR ACTUATING CYLINDER - STORAGE AND SHIPMENT.

(See Figure 6.)

a. Drain residual fuel from fittings and ports.

b. Ensure attaching parts are removed. Refer to paragraph 3.

NOTE

Refer to T.O. 3D4-6-617-1 hydraulic pressure tester for operating instructions on use of cart.

c. Connect EXTEND hose from PWA 50096 tester, containing MIL-L-6081 engine oil, to PFEXT port using fitting.

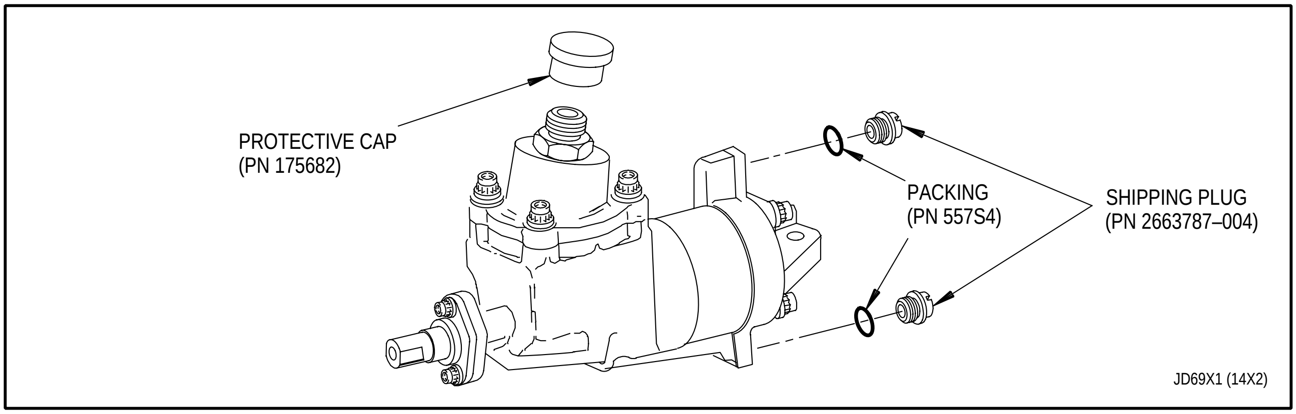


Figure 6. Rear Compressor Variable Vane Linear Actuating Cylinder - Storage and Shipment

d. Connect RETRACT hose from PWA 50096 tester to PFRET port using fitting.

e. Apply 45 to 55 psig pressure to cylinder.

f. Operate selector valve on tester to EXTEND position, then to OFF, then to RETRACT position, then to OFF. Repeat this cycle three times.

g. Reduce pressure to zero. Remove lines and fittings.

h. Manually extend and retract actuating rod on cylinder, until excess fluid is displaced. Leave actuating rod in retracted position.

i. Install protective closures on electrical connector and ports.

WORK PACKAGE

TECHNICAL PROCEDURES

CONTROL - PUSH-PULL, REAR COMPRESSOR VARIABLE VANE FEEDBACK

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 20

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	15	8 - 9	15	13 - 16	0
2	0	10	0	17	13
3	13	11 - 12	7	18 - 19	0
4 - 7	0			20 Blank	9

REFERENCE MATERIAL REQUIRED

None

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Compound, antigalling, (PWA 550)	Hi-T-650 or Lubri-Bond HT
Lockwire (0.032 inch diameter)	MS9226-04

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Key washer	4060963	1
Washer	MS9549-13	1

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
5	Rear Compressor Variable Vane Feedback Push-Pull Control - Freedom of Movement Check	
	Pin - Fuel Control Rear Compressor Variable Vane Feedback Pulley - - - - - - - - - - - - - - - -	PWA 57137

ILLUSTRATED SUPPORT EQUIPMENT

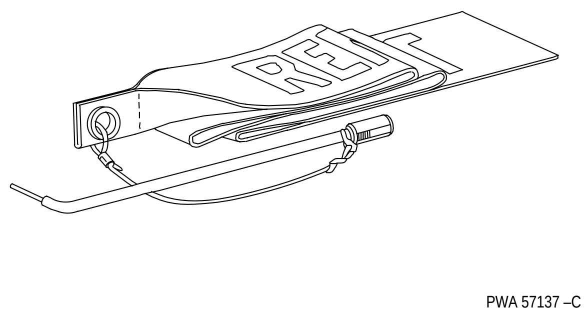


Figure T1. PWA 57137 Pin

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures for the rear compressor variable vane (RCVV) feedback push-pull control:

- Removal
- Inspection
- Installation
- Freedom of movement check
- Follow-on maintenance

2. REAR COMPRESSOR VARIABLE VANE FEEDBACK PUSH-PULL CONTROL - REMOVAL.

(See Figures 1 and 2.)

CAUTION

- Pulley on main fuel control is spring-loaded and will retract when RCVV feedback push-pull control is disconnected from compressor stator arm. Push-pull control shall be restrained to retract slowly or damage to pulley stop may occur.
- Do not bend end of RCVV feedback push-pull control more than 8 degrees maximum from control axis. (See figure 1.) Seal and support tube details will become disengaged from conduit end cap if bent more than 8 degrees from control axis.

a. Remove RCVV feedback push-pull control. (See figure 2.)

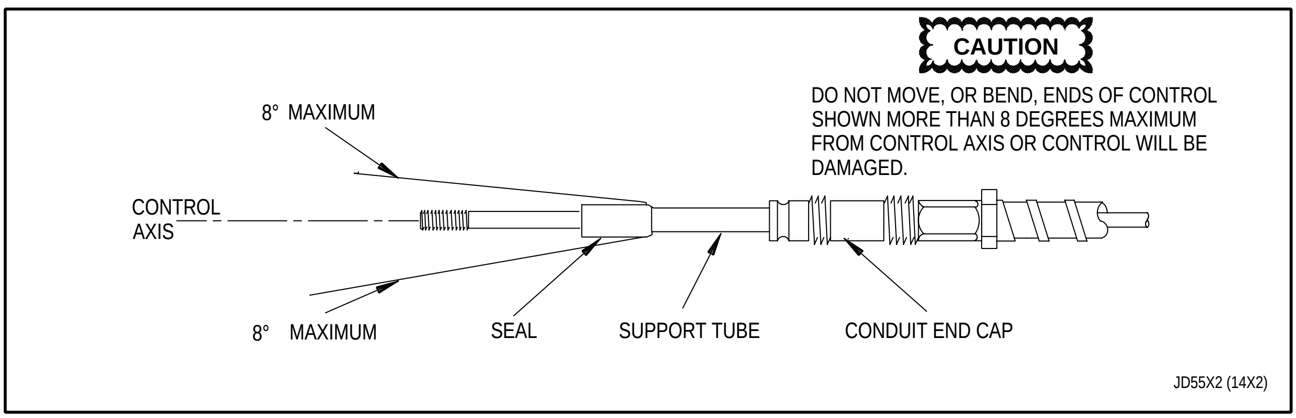
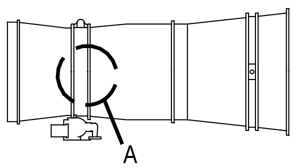


Figure 1. Caution For Handling Rear Compressor Variable Vane Feedback Push-Pull Control



a. RESTRAIN PUSH–PULL CONTROL AND REMOVE COTTER PIN, NUT AND BOLT HOLDING CONTROL TO STATOR SYNCHRONIZING ARM. DISCARD COTTER PIN.

b. REMOVE ROD END CLEVIS, WASHER AND NUT FROM CONTROL. DISCARD WASHER.

c. HOLD CONTROL HEX WITH WRENCH AND REMOVE SLEEVE NUT AND WASHER.

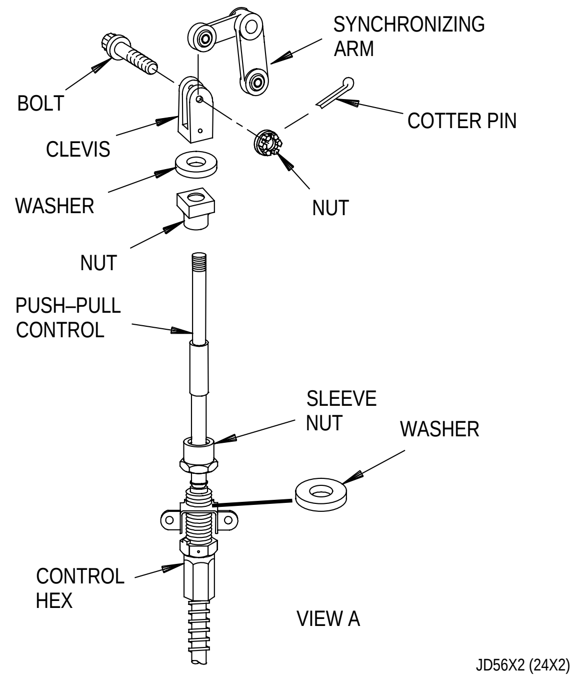


Figure 2. Rear Compressor Variable Vane Push-Pull Control - Removal (Sheet 1 of 3)

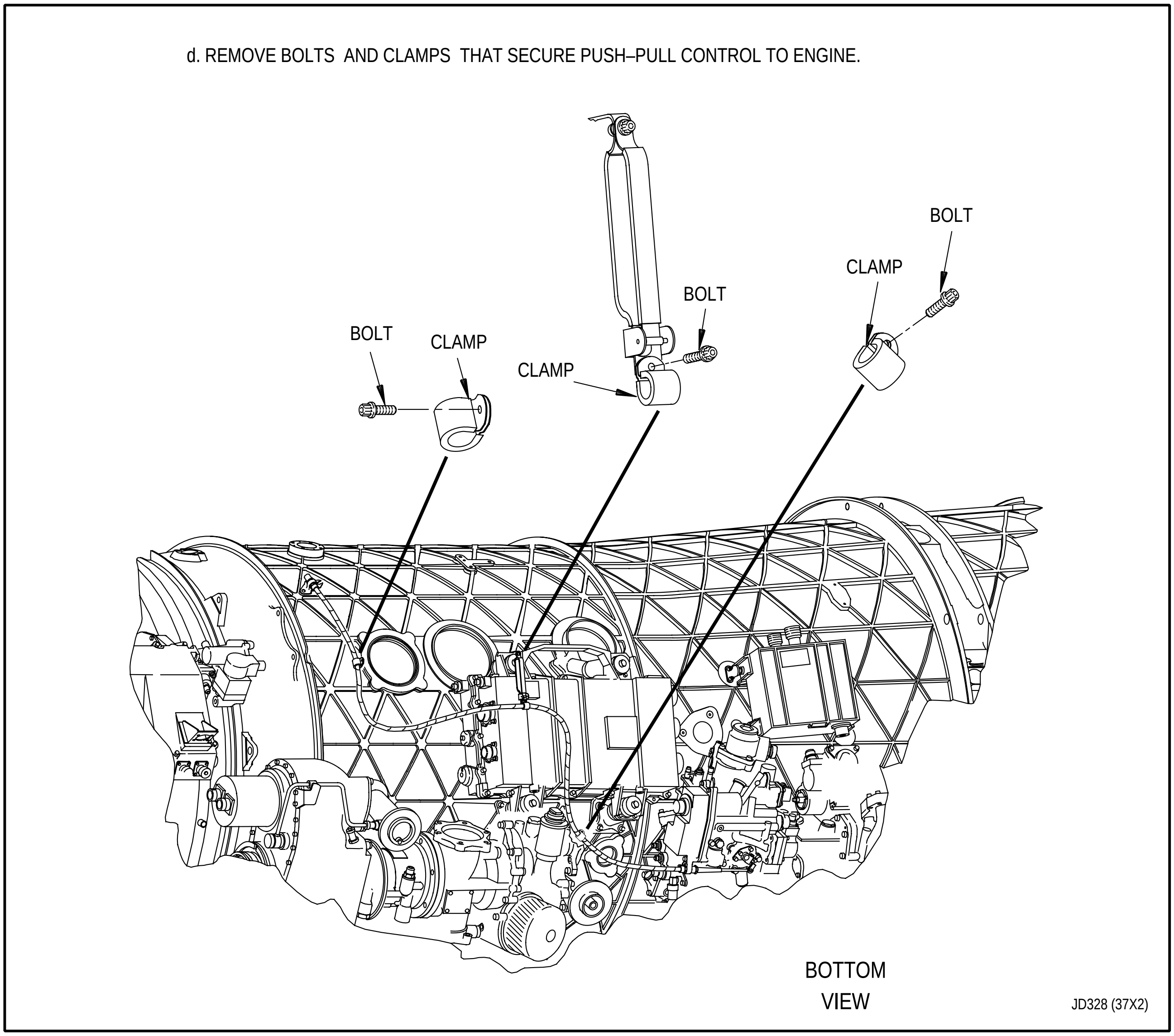


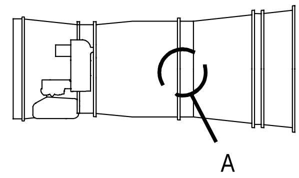
Figure 2. Rear Compressor Variable Vane Push-Pull Control - Removal (Sheet 2 of 3)

e. REMOVE BOLT AND BRACKET FROM PULLEY ON MAIN FUEL CONTROL.

f. LOOSEN BOLT AND UNTHREAD ROD END FROM PUSH–PULL CONTROL.

g. REINSTALL BRACKET AND BOLT ON PULLEY.

h. HOLD HEX ON PUSH–PULL CONTROL AND REMOVE REAR SLEEVE NUT (20) AND WASHER (21). RETAIN WASHERS FOR INSPECTION.



CAUTION

DO NOT BEND END OF RCVV FEEDBACK PUSH–PULL CONTROL MORE THAN 8 DEGREES MAXIMUM FROM CONTROL AXIS. SEAL AND SUPPORT TUBE DETAILS WILL BECOME DISENGAGED FROM CONDUIT END CAP IF BENT MORE THAN 8 DEGREES FROM CONTROL AXIS.

i. WITHDRAW PUSH–PULL CONTROL FROM LUG ON MAIN FUEL CONTROL AND REMOVE FROM ENGINE. RETAIN WASHER (23) FOR INSPECTION.

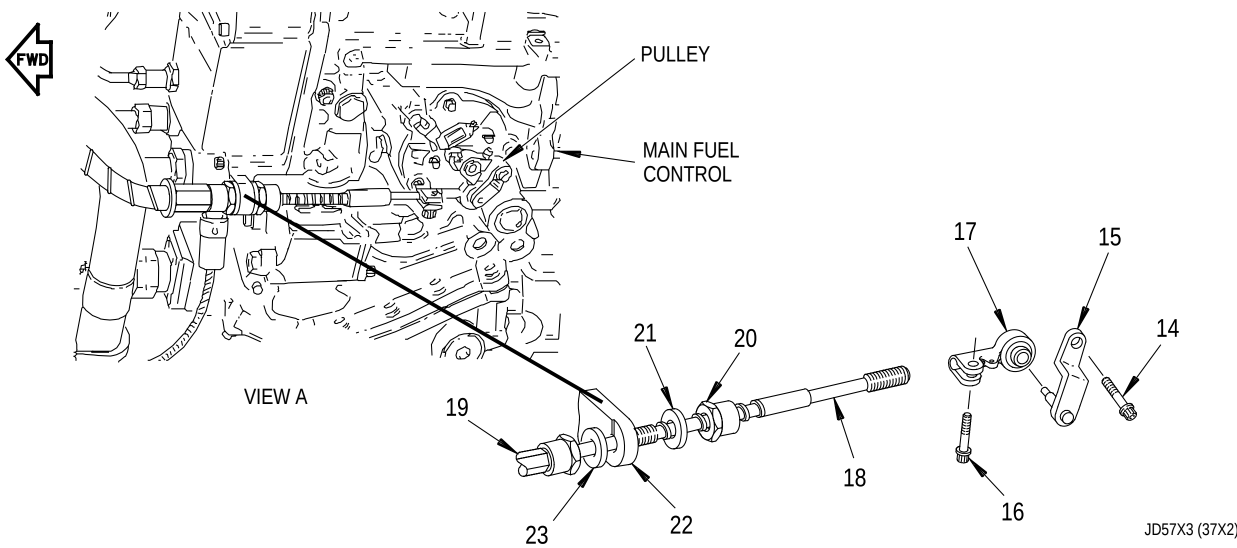


Figure 2. Rear Compressor Variable Vane Push-Pull Control - Removal (Sheet 3 of 3)

3. REAR COMPRESSOR VARIABLE VANE PUSH-PULL CONTROL AND ATTACHING PART - INSPECTION.
(See Figures 3 and 4.)

a. Inspect bearing details of stator synchronizing arm assembly for freedom of movement of ball in its race as follows:

NOTE

Check for axial movement of bearing.

(1) Ensure that bearing is clean and free of foreign material.

(2) Ball in stator synchronizing arm shall move through 9 degrees minimum cone angle with a torque of 5 pound-inches maximum.

(3) Replace stator synchronizing arm assembly that has a frozen, rough, or sticking bearing.

(4) Replace RCVV push-pull control if any bearing detail is found to be frozen, rough, or sticking.

NOTE

360 degree rotation of the support tube relative to the outer conduit is normal.

b. Inspect RCVV feedback push-pull control as follows: (See figure 3.)

(1) Grasp the support tube by hand and, using minimal force, attempt to slide it relative to outer conduit with other hand. Repeat procedure at other end of control.

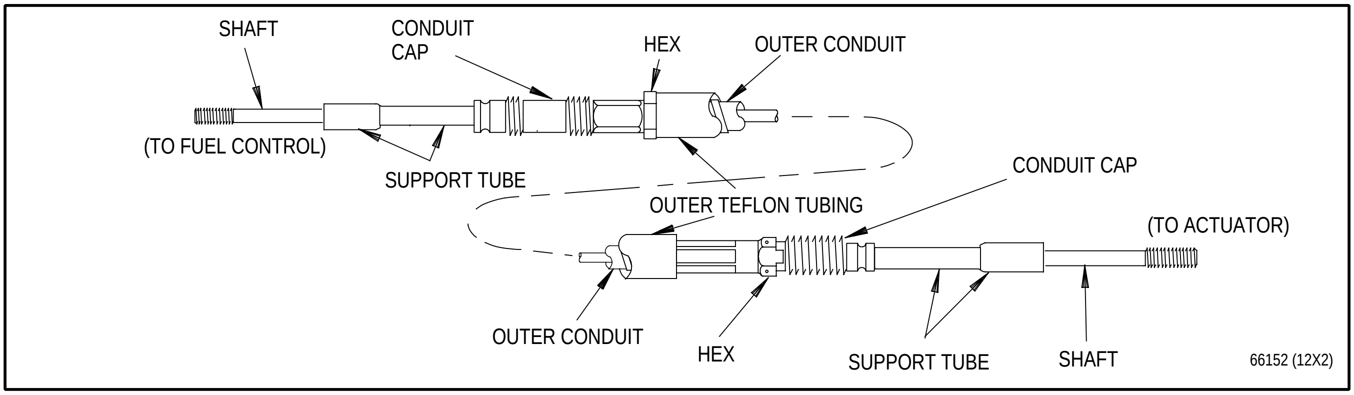


Figure 3. Rear Compressor Variable Vane Feedback Push-Pull Control - Inspection

(2) Replace control if support tube at either end of the control outer conduit can be slid more than 0.125 inch.

NOTE

Hex will normally not rotate with respect to conduit.

(3) Hold outer conduit with one hand and try to rotate hex with fingers of other hand. Repeat procedure at other end of control.

(4) Replace control if hex at actuator end rotates more than 180 degrees with respect to outer conduit or hex at fuel control end rotates more than 10 degrees.

(5) Attempt to rotate outer conduit relative to conduit cap. Repeat at other end of control.

(6) Replace control if rotation at either end exceeds 10 degrees.

NOTE

The force needed to push/pull the shaft should be free of friction.

(7) Hold conduit with one hand and push/pull the shaft with the other.

(8) Replace control if shaft movement is not smooth.

c. Inspect remaining parts and push-pull control. (See figure 4.)

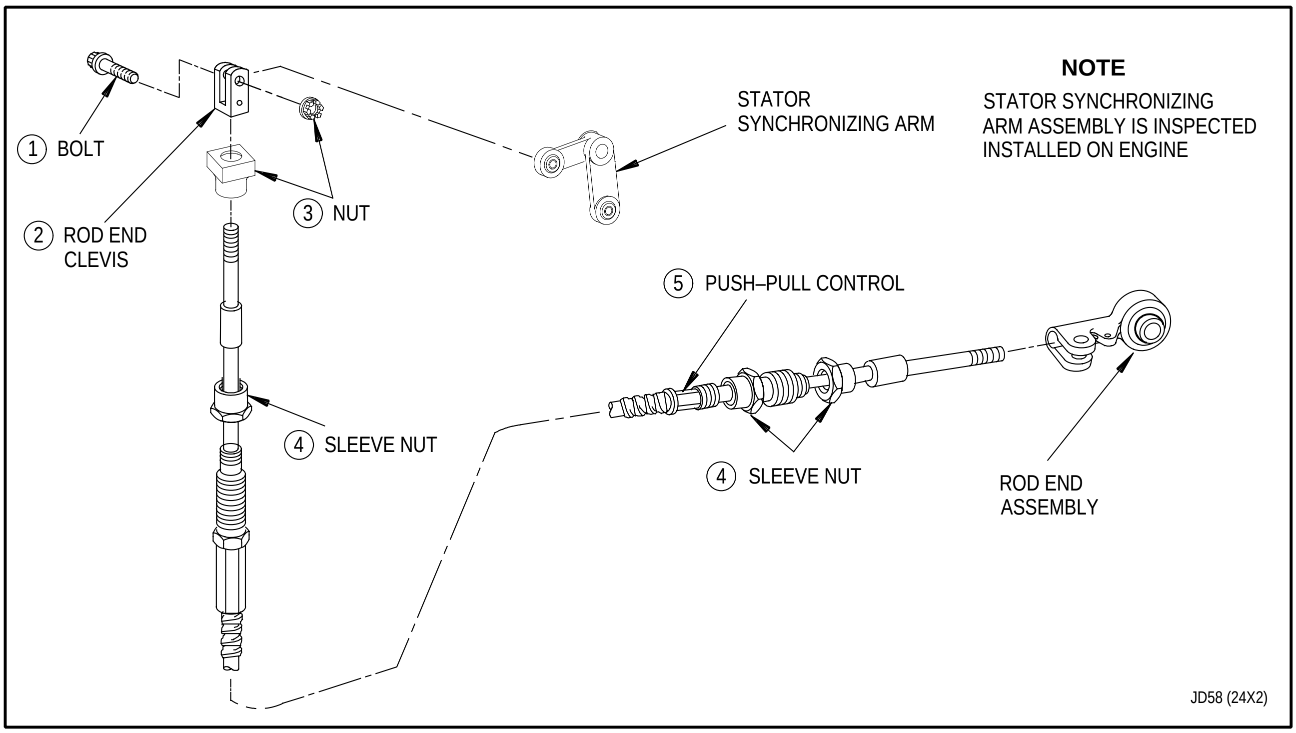


Figure 4. Rear Compressor Variable Vane Feedback Push-Pull Control and Attaching Parts - Inspection

Legend for figure 4

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Bolt -			
Worn,cracked	Not serviceable	Not reparable	Replace bolt.
Threaddamaged	Not serviceable	Minor damage reparable	Repair minor thread damage using thread die or fine stone. Replace bolt having missing threads.
2. Rod end clevis -			
Worn,cracked, orgalled	Not serviceable	Not reparable	Replace rod end clevis.
Threaddamaged	Not serviceable	Not reparable	Replace rod end clevis.
3. Nut -			
Cracked orthread damaged	Not serviceable	Not reparable	Replace nut.
4. Sleeve nut -			
Cracked orthreaddamaged	Not serviceable	Not reparable	Replace sleeve nut.
5. Push-pull control -			
Bent,deformed, orkinked	Not serviceable	Not reparable	Replace push-pull control.

4. REAR COMPRESSOR VARIABLE VANE FEEDBACK PUSH-PULL CONTROL - INSTALLATION.
(See Figures 5 and 6.)

a. Remove bolt and bracket from pulley on main fuel control.

CAUTION

Do not bend end of push-pull control more than 8 degrees maximum from control axis. Seal and support tube details will become disengaged from conduit end cap if bent more than 8 degrees from control axis.

b. Apply a light coat of PWA 550 antigalling compound to threads of push-pull feedback control.

c. Install sleeve nut onto double threaded end of push-pull control. Thread nut until it contacts stop. Install washer on control.

d. Insert double threaded end of control through lug on main fuel control.

e. Install washer and sleeve nut on control.

f. Tighten both sleeve nuts fingertight against lug on main fuel control.

g. Thread rod end onto end of control until last thread is flush with rod end, then thread rod end 4 to 6 more turns onto control. Verify that 0.125 to 0.1875 inch of unthreaded control can be seen inside slot of rod end.

h. Install bolt through rod end.

i. Insert pin of bracket through bearing of rod end. Secure bracket to pulley with bolt. Torque bolt 8 to 10 pound-inches.

j. Torque bolt in rod end 14 to 19 pound-inches. Do not lockwire bolt at this time.

CAUTION

Normal bearing movement allows rod end rotation of approximately 15 to 20 degrees from full clockwise stop to full counterclockwise stop. A frozen or rough/sticking bearing is not serviceable.

k. Grasp rod end with fingers. Rotate rod end clockwise and counterclockwise approximately 15 to 20 degrees.

l. Replace rod end if bearing is frozen, rough, or sticking.

m. Secure control to engine with clamps, bolts, and nuts as shown in figure 5, Sheet 2. Torque nuts 27 to 30 pound-inches.

n. Perform RCVV feedback push-pull control freedom of movement check per paragraph 5.

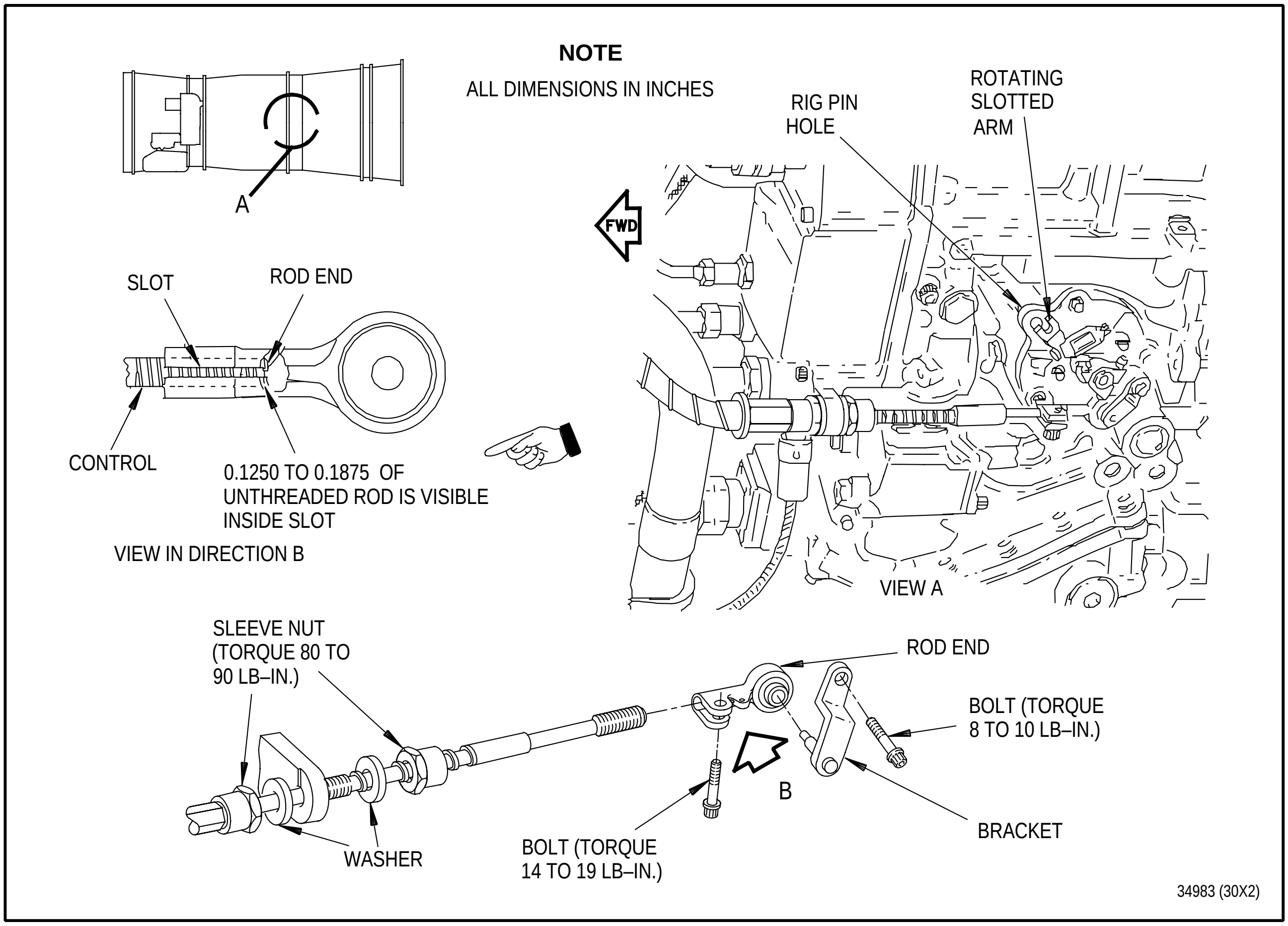


Figure 5. Rear Compressor Variable Vane Feedback Push-Pull Control - Installation (Sheet 1 of 2)

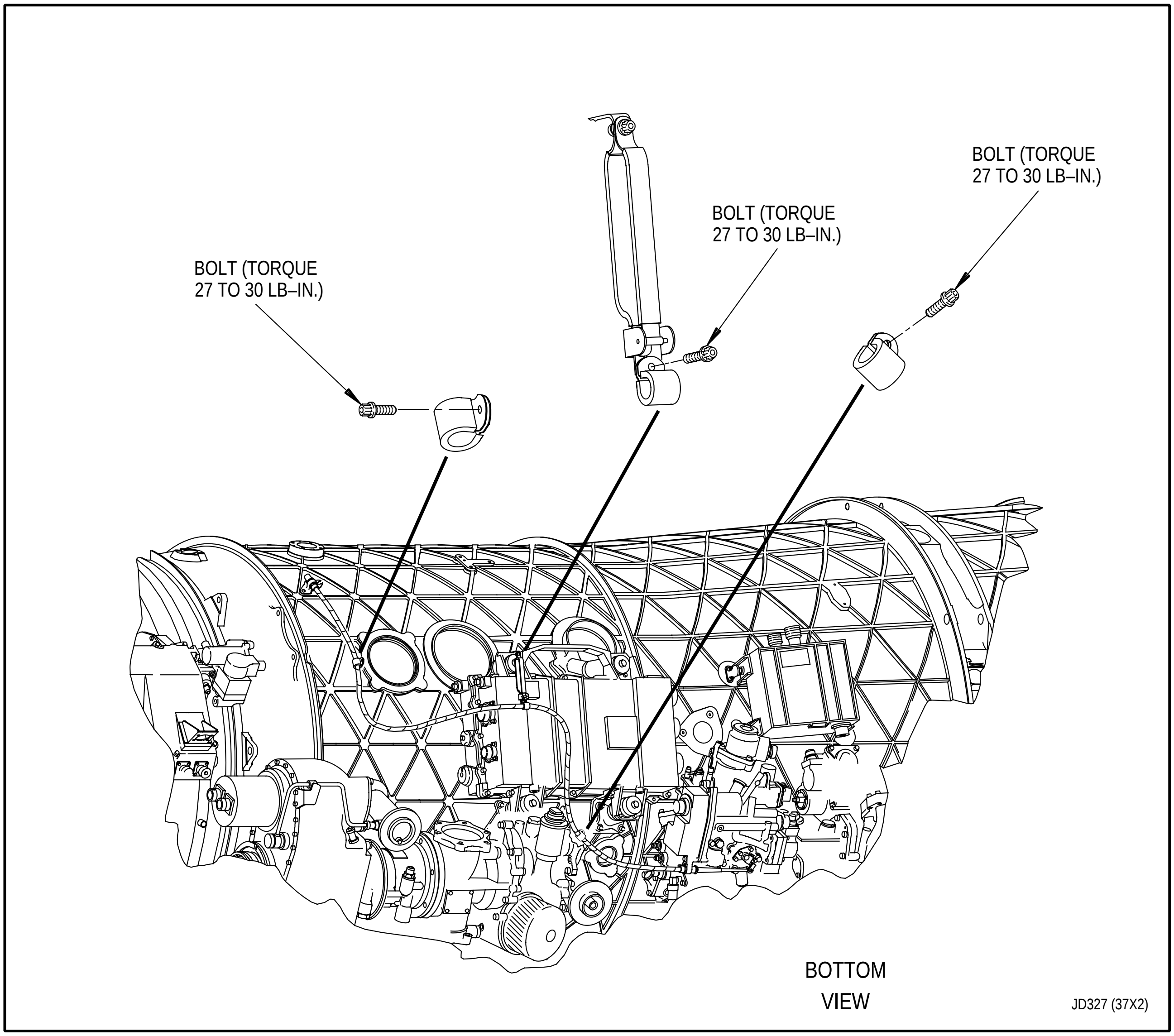


Figure 5. Rear Compressor Variable Vane Feedback Push-Pull Control - Installation (Sheet 2 of 2)

CAUTION

Do not bend end of RCVV feedback push-pull control more than 8 degrees maximum from control axis. Seal and support tube details will become disengaged from conduit end cap if bent more than 8 degrees from control axis.

o. Install RCVV feedback push-pull control in mounting bracket as follows: (See figure 6.)

(1) Put a light coat of PWA 550 antigalling compound on threads at actuator end of push-pull control.

(2) Install push-pull control through bracket and position key on control in keyway in bracket.

(3) Install washer and sleeve nut on control. Hold hex on control and torque sleeve nut 80 to 90 pound-inches. Lockwire using PN MS9226-04 wire.

(4) Install nut, small OD first, and new key washer on end of push-pull control.

(5) Thread rod end clevis onto push-pull control. Ensure threads on push-pull control extend into rod end clevis beyond witness hole.

(6) Secure rod end clevis to push-pull control by tightening nut against key washer and rod end. Torque nut 17 to 19 pound-inches.

(7) Lock nut and rod end clevis by bending key washer against flats of nut and rod end.

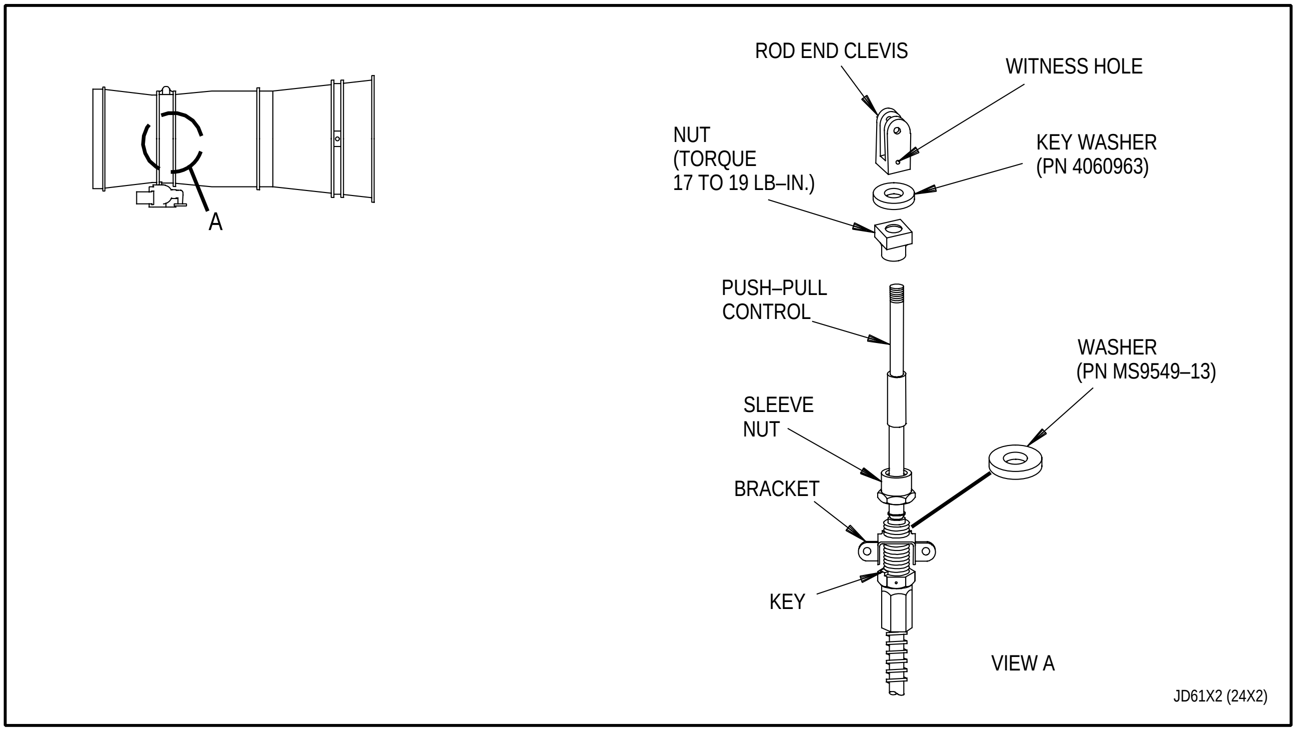


Figure 6. Rear Compressor Variable Vane Feedback Push-Pull Control - Installation on Bracket

5. REAR COMPRESSOR VARIABLE FEEDBACK PUSH-PULL CONTROL - FREEDOM OF MOVEMENT CHECK.
(See Figures 7 and 8.)

a. Check RCVV feedback push-pull control for freedom of movement. (See figure 7.)

b. If push-pull control does not return to its original position without application of force, proceed as follows:

(1) Inspect push-pull control for bends of less than 3.00 inch radius. If controlhas bends of less than 3.00 inch radius perform following:

(a) Loosen bolts and nuts securing control clamps.

(b) Reposition control as necessary to increase bends to 3.00 inch radius minimum.

(c) Torque clamp bolts and nuts 27 to 30 pound-inches.

(d) Repeat freedom of movement check. (See figure 7.) If satisfactory, proceed to paragraph 6.

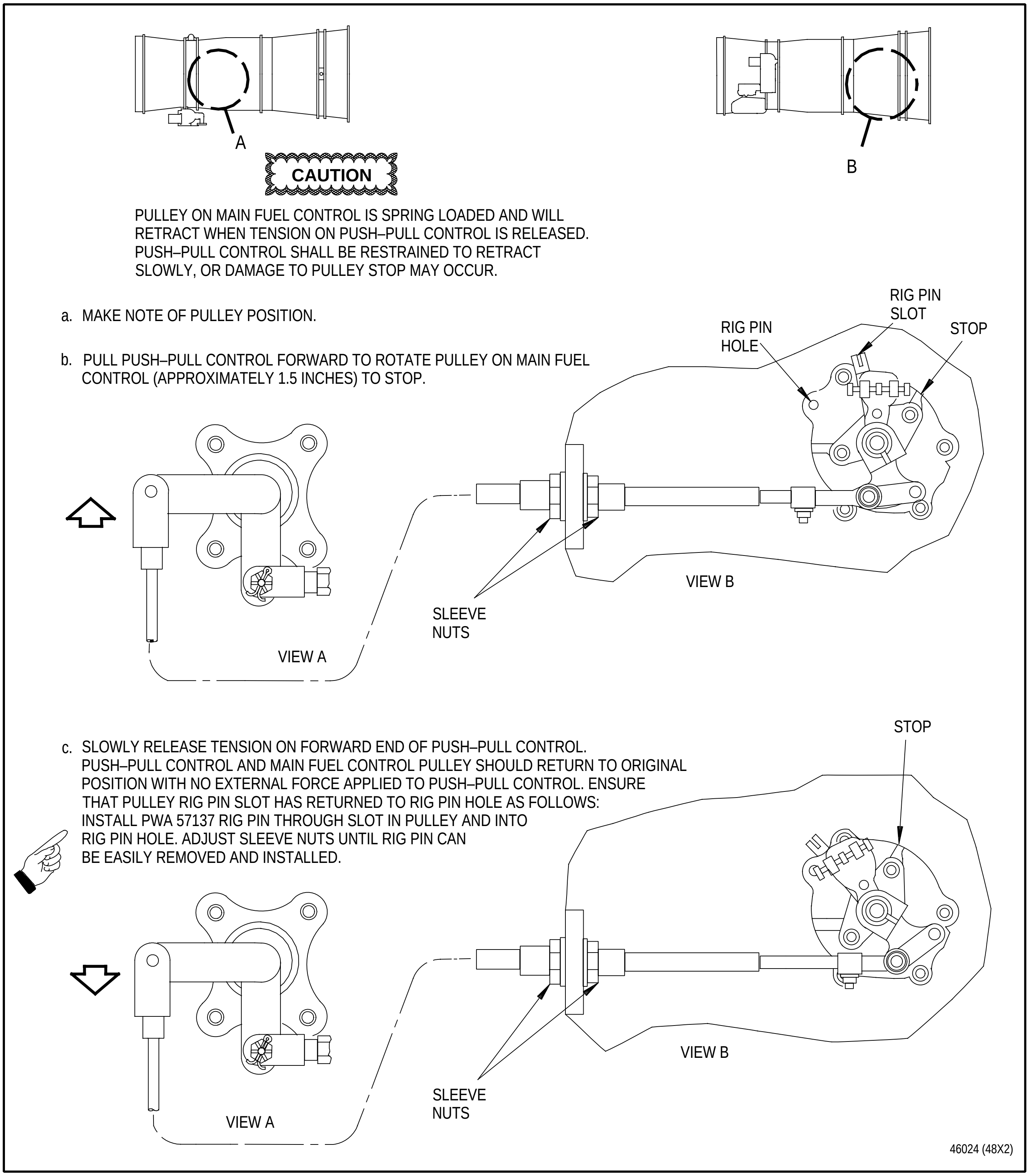


Figure 7. Rear Compressor Variable Vane Feedback Push-Pull Control - Freedom of Movement Check

(2) If push-pull control still does not move freely, perform the following:

(a) Disconnect push-pull control from pulley on main fuel control. Refer to paragraph 2.

(b) Inspect push-pull control and pulley on main fuel control. (See figure 8.)

(c) Replace push-pull control or main fuel control as required.

(d) Connect push-pull control to pulley on main fuel control. Refer to paragraph 4.

(e) Perform freedom of movement check. Refer to paragraph 5 step b.

6. FOLLOW-ON MAINTENANCE.

a. Rig RCVV push-pull feedback system. Refer to WP 103 00. Do not perform freedom of movement check at this time.

a. LOOP LENGTH OF PN MS9226-04 LOCKWIRE AROUND PIN OF PULLEY BRACKET.

b. THREAD LOCKWIRE THROUGH LUG.

c. ATTACH LOCKWIRE TO SCALE.

CAUTION

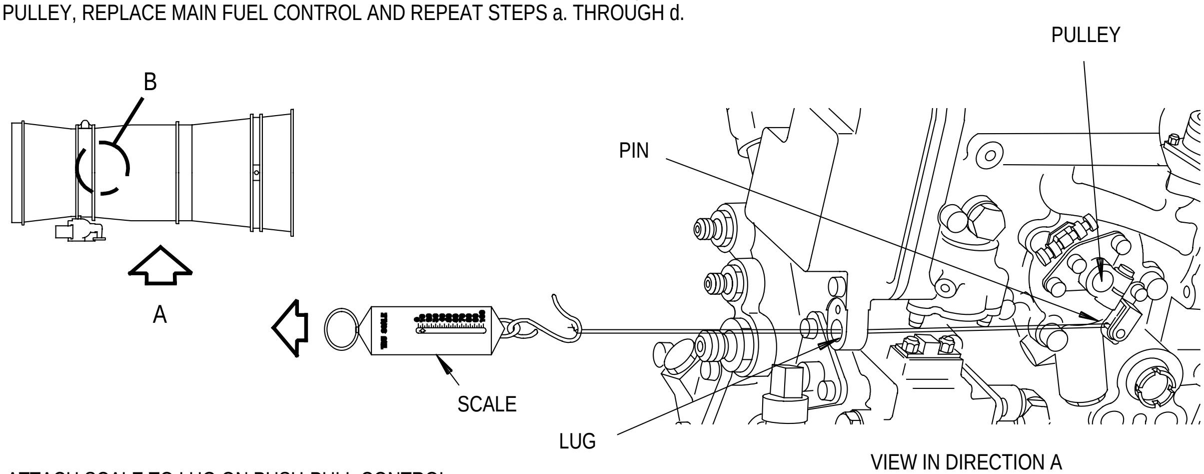
PULLEY ON MAIN FUEL CONTROL IS SPRING LOADED AND WILL RETRACT WHEN TENSION ON PUSH-PULL CONTROL IS RELEASED. PUSH-PULL CONTROL SHALL BE RESTRAINED TO RETRACT SLOWLY, OR DAMAGE TO PULLEY STOP MAY OCCUR.

NOTE

TO PREVENT FALSE READINGS, ENSURE LOCKWIRE DOES NOT REST AGAINST INNER DIAMETER OF LUG WHILE APPLYING FORCE.

d. RESTRAIN MAIN FUEL CONTROL AND APPLY FORCE OF 9 TO 22 POUNDS TO PULLEY ON MAIN FUEL CONTROL. RECORD AMOUNT OF FORCE REQUIRED TO ROTATE PULLEY.

e. IF LESS THAN 9 POUNDS OR MORE THAN 22 POUNDS OF FORCE IS REQUIRED TO ROTATE PULLEY, REPLACE MAIN FUEL CONTROL AND REPEAT STEPS a. THROUGH d.

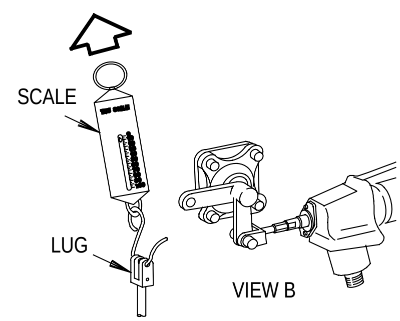


f. ATTACH SCALE TO LUG ON PUSH-PULL CONTROL.

g. APPLY PULLING FORCE TO CONTROL CLEVIS.

h. RECORD AMOUNT OF FORCE REQUIRED TO MOVE INNER DETAIL OF CONTROL IN DIRECTION OF APPLIED FORCE.

i. SUBTRACT AMOUNT OF FORCE RECORDED IN STEP h. FROM THAT RECORDED IN STEP d. IF RESULT IS 3 OR MORE POUNDS, PUSH-PULL CONTROL IS SERVICEABLE. IF RESULT IS LESS THAN 3 POUNDS, REPLACE PUSH-PULL CONTROL AND REPEAT STEPS f. THROUGH i.



JD63X4 (51X2)

Figure 8. Rear Compressor Variable Vane Feedback Push-Pull Control and Main Fuel Control Pulley - Inspection

WORK PACKAGE

TECHNICAL PROCEDURES

CONTROL AND CYLINDER - VARIABLE VANE, COMPRESSOR INLET

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 28

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2A	28	8	0	15 - 16	17
2B Blank	6	9	5	17 - 18	0
3	17	10 - 13	0	19	22
4 - 6	0	14	28	20 - 25	0
7	22			26 Blank	6

REFERENCE MATERIAL REQUIRED

Title	Number
Engine Pretest and Posttest Procedures: - - - - - - - - - - - - -	T.O. 2J-F100-11-2
Engine Leak Check Test and Gaspath Inspection: - - - - - - -	WP 302 00
Introduction and General Information: - - - - - - - - - - - - - -	T.O. 2J-F100-53-1
General Maintenance Procedures: - - - - - - - - - - - - - - - - - -	WP 021 00
Inlet/Fan Module: -	T.O. 2J-F100-53-6
Compressor Inlet Variable Vane (CIVV) Cylinder System - Rigging: -	WP 705 00
Hydraulic Pressure Cart: -	T.O. 33D29-3-6-1
Hydraulic Pressure Tester PWA 50096: - - - - - - - - - - - - - - -	T.O. 33D4-6-617-1

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

T. O. No.	Date	Level	Title (ECP No.)
2J-F100229(I)-516	30 NOV 96	O/I	Replacement of PN 4075565 and PN 4075566 Compressor Inlet Variable Vane (CIVV) Actuator Rod Clevises, F100-PW-229 Engines, F-15 Aircraft. (ECP 95QA027)

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
ALCOHOL, DENATURED OR	O-E-760, TYPE III OR
TRICHLOROETHANE INHIBITED-1,1,1	O-T-620
CLOTH, LINT-FREE	-
COMPOUND, ANTIGALLING (PWA 36545)	ESNALUBE 382
COMPOUND, ANTIGALLING (PWA 550)	HI-T-650 OR LUBRI-BOND HT
OIL, LUBRICATING (PMC 9852)	MIL-L-6081, GRADE 1010
OIL, LUBRICATING (PWA 521, TYPE I) OR PETROLATUM	MIL-L-7808 VV-P-236
SOLVENT, PETROLEUM	P-D-680, TYPE II
TAPE, MASKING (CLOTH BACKING)	MYSTIK 5863 RED

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
KEY WASHER	4004816	1
PACKING	2564606-O	1
PACKING	MS9966-04	3
PACKING	MS9966-06	2
PIN, COTTER	MS9245-24	2
RETAINER	4075643	1

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
4	COMPRESSOR INLET VARIABLE VANE CONTROLAND CYLINDER - REMOVAL OF ATTACHING PARTS	
	FIXTURE, POSITIONING, VARIABLE GUIDE VANE ACTUATOR -	PWA 57489
7	COMPRESSOR INLET VARIABLE VANE CONTROLAND CYLINDER - INSTALLATION OF ATTACHING PARTS	
	FIXTURE, POSITIONING, VARIABLE GUIDE VANE ACTUATOR -	PWA 57489
10	COMPRESSOR INLET VARIABLE VANE CONTROLAND CYLINDER - LEAK CHECK	
	TESTER, HYDRAULIC PRESSURE - - - - - - - - - - - - - - - - - -	PWA 50096
11	COMPRESSOR INLET VARIABLE VANE CONTROL AND CYLINDER - PRESERVATION FOR STORAGE AND SHIPMENT	
	ADAPTER, FLUID INLET AND OUTLET - - - - - - - - - - - - - -	PN 2564606-11

ILLUSTRATED SUPPORT EQUIPMENT

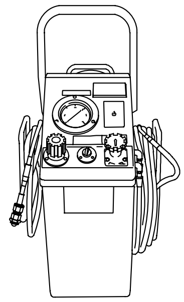


Figure T1. PWA 50096 Tester

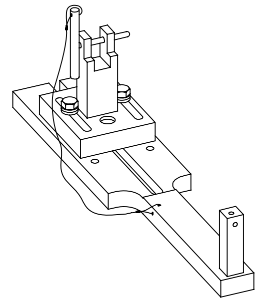


Figure T2. PWA 57489 Fixture

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures for the compressor inlet variable vane (CIVV) control and cylinder:

- Preliminary Instructions
- Removal
- Removal of attaching parts
- Cleaning
- Inspection
- Assembly of attaching parts
- Installation
- CIVV control and cylinder electro-hydraulic servo valve (EHV) - Replacement
- Leak check
- Storage and shipment
- Follow-on maintenance

2. PRELIMINARY INSTRUCTIONS.

a. Remove engine diagnostic unit per WP 023 00.

3. COMPRESSOR INLET VARIABLE VANE CONTROL AND CYLINDER - REMOVAL.

(See Figure 1.)

WARNING

Jet fuel may be expelled from actuator if cylinder rod is moved while manifold tubes are disconnected.

a. Disconnect the following tubes from CIVV control and cylinder.(See figure 1,Sheet 1.)

(1) CIVV fuel manifold from lower outboard port (PF1).

(2) CIVV retract tube from top center outboard port (PFRET).

(3) Pressure to backup mode signal tube from upper outboard port (PFMO).

(4) CIVV extend tube from lower center port (PFEXT).

(5) CIVV fuel supply pressure tube from lower inboard port (PF2F).

(6) Install protective closures.

b. Disconnect electrical cable connectors P93 and P94 from control and cylinder. Place protective closures on connectors and tubes.

c. Remove retainer, cotter pin, and clevis pin holding control and cylinder clevis to front compressor stator bellcrank(figure 1, Sheet 2). Discard cotter pin.

d. Remove nut and bolt holding control and cylinder to compressor stator inlet connecting link.

e. Remove cotter pin, nut, and bolt holding control and cylinder to support. Discard cotter pin.

f. Remove control and cylinder.

g. Purge fuel from cylinder.

h. Install protective closures on electrical connectors and cylinder ports.

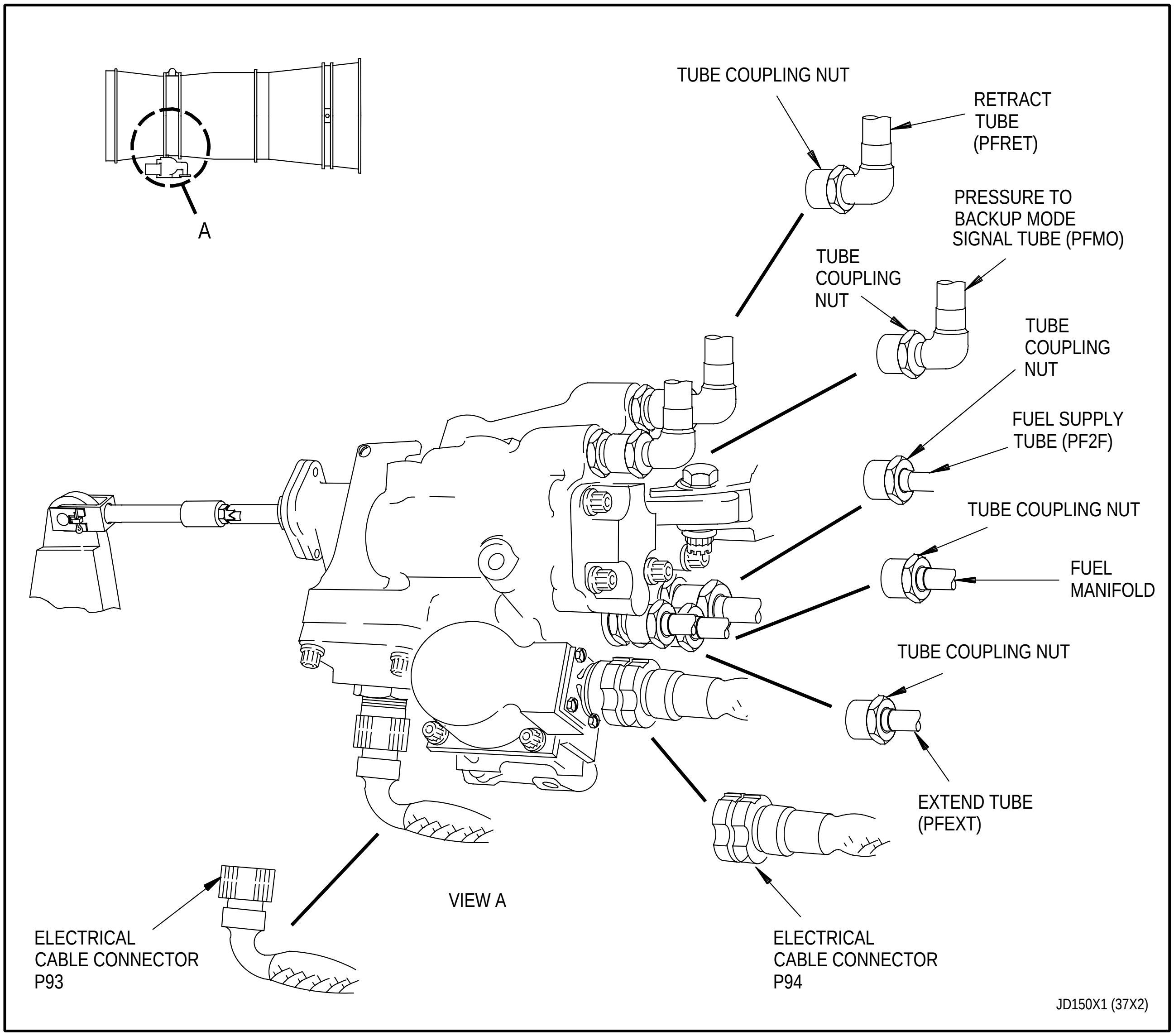


Figure 1. Compressor Inlet Variable Vane Control and Cylinder - Removal (Sheet 1 of 2)

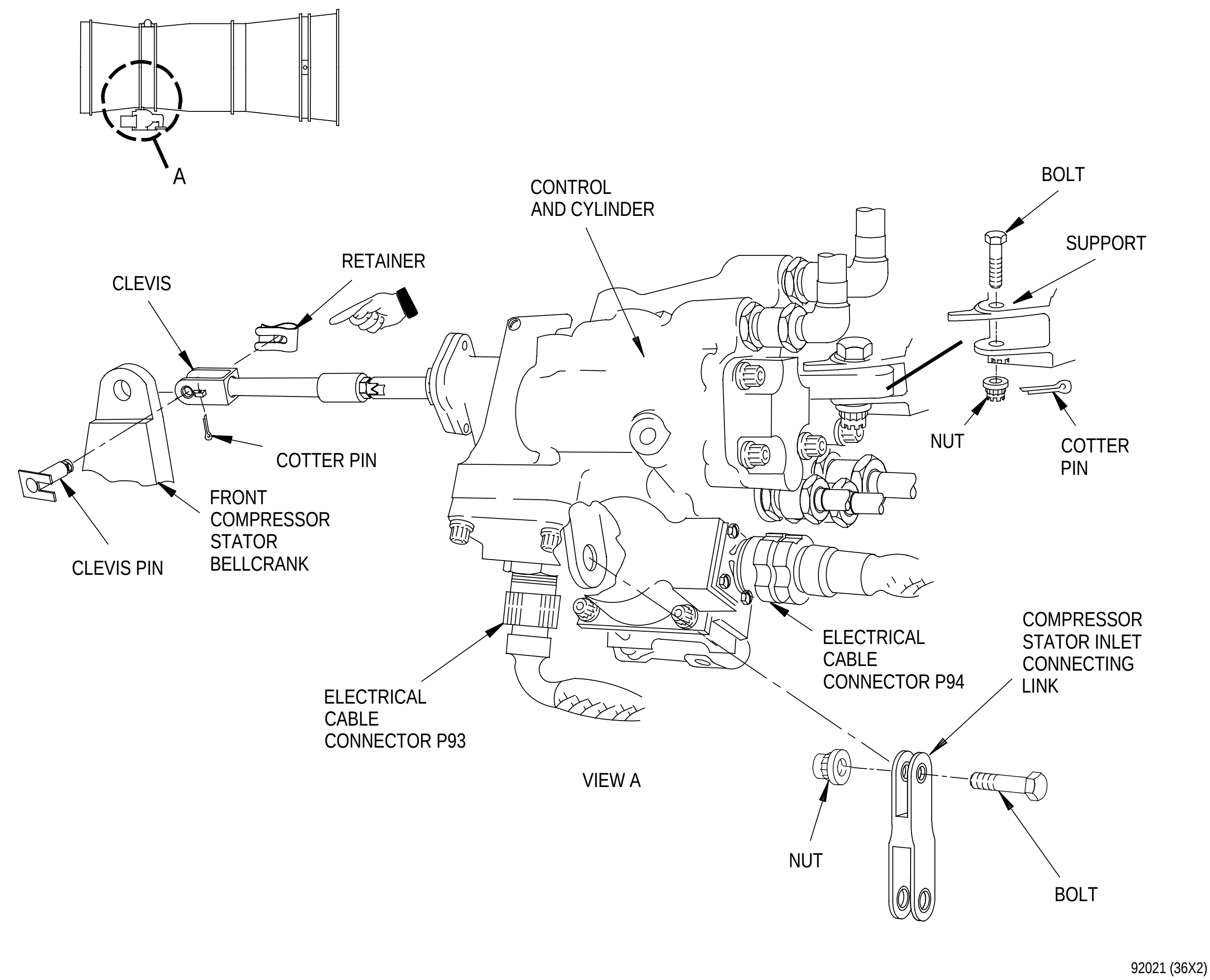


Figure 1. Compressor Inlet Variable Vane Control and Cylinder - Removal (Sheet 2 of 2)

4. COMPRESSOR INLET VARIABLE VANE CONTROL AND CYLINDER - REMOVAL OF ATTACHING PARTS.
(See Figure 2.)

NOTE

CIVV control and cylinder is rigged to front compressor inlet synchronizing ring.

a. Index control and cylinder retracted length, using specified fixture, before removing attached parts. Loosen bolts on PWA 57489 fixture. Remove T-pin from fixture yoke.

WARNING

Jet fuel may be expelled from the actuator when the cylinder rod is moved and the manifold tubes are disconnected.

b. Push cylinder rod into CIVV control and cylinder as far as it will go. Place upper rear mounting lug of control and cylinder on dowel pin of fixture.

c. Position clevis of control and cylinder in yoke of fixture. Move yoke pad as required until T-pin can be inserted through yoke and clevis smoothly.

d. Lock pad in place by tightening bolts.

e. Make notation on tag identifying fixture by CIVV and engine serial numbers. Fixture is not to be reset until cylinder has been adjusted. Tag fixture.

f. Remove T-pin from yoke and remove control and cylinder from fixture. Replace T-pin in yoke.

NOTE

Control and cylinder may be clamped in a soft jawed vise for ease of removing adapters.

g. Remove five adapters and packings from rear of control and cylinder. Discard packings and install protective closures.

h. Remove clevis, sleeve nut, and key washer from control and cylinder. Discard key washer.

i. Retain sleeve nut and clevis.

j. Refer to paragraph 10 for storage and shipment.

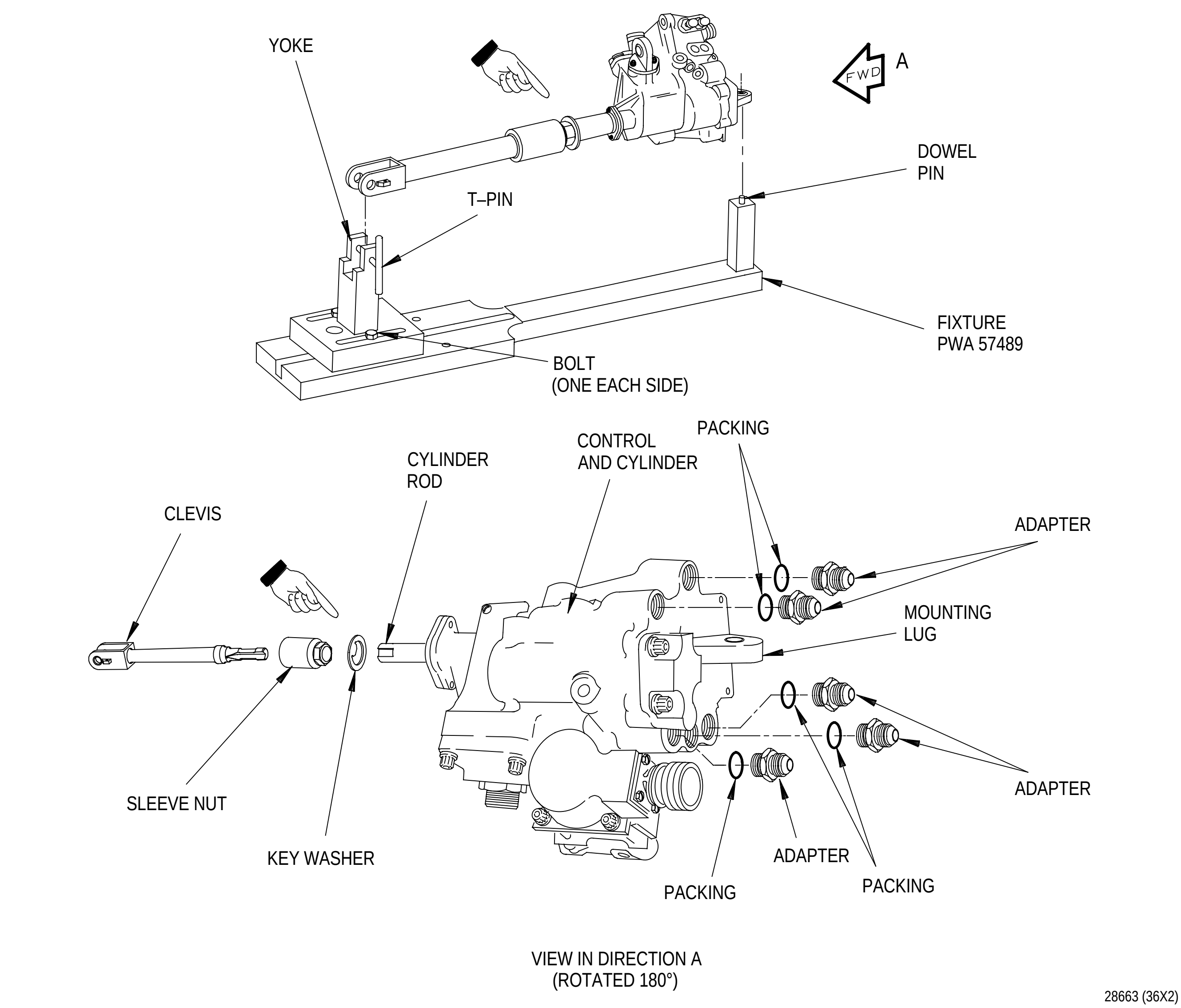


Figure 2. Compressor Inlet Variable Vane Control and Cylinder - Removal of Attaching Parts

5. COMPRESSOR INLET VARIABLE VANE CONTROL AND CYLINDER - CLEANING.

a. Using a clean cloth moistened with P-D-680, Type II petroleum solvent, wipe exterior of CIVV control and cylinder.

b. Wipe control and cylinder dry with clean, dry lint-free cloth.

c. Clean electrical connectors P93 and P94 pins, sockets, and cable insulation of cables that connects to control and cylinder with O-E-760, Type III denatured alcohol or Trichloroethane inhibitor-1,1,1 O-T-620.

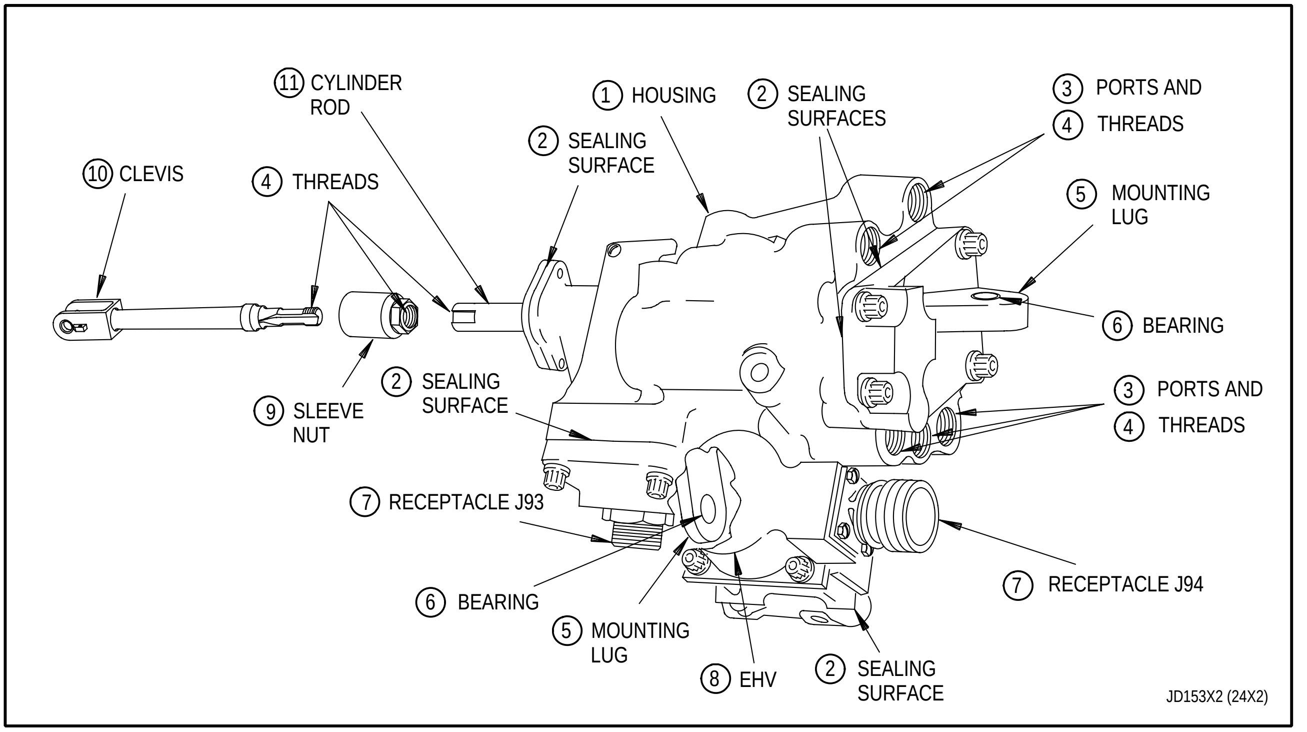
d. Let electrical connector air dry or dry with clean compressed air at less than 30 psig.

6. COMPRESSOR INLET VARIABLE VANE CONTROL AND CYLINDER - INSPECTION.
(See Figure 3.)

a. Inspect CIVV control and cylinder. (See figure 3.)

b. Inspect electrical connectors for bent pins. Refer to T.O. 2J-F100-53-1, WP 021 00.

c. Remove protective closures from electrical connectors P93 and P94 on CIVV control cable. Inspect pin sockets and cable sheath. Ensure pin sockets are not broken or cracked and cable sheath is not worn or frayed. Replace questionable cables. Replace protective closures on cable connectors.



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Housing -			
Cracked	Not serviceable	Not reparable	Replace control and cylinder.
2. Sealing surfaces -			
Leaking	Not serviceable	Not reparable	Replace control and cylinder.
3. Ports -			
Damaged	Not serviceable	Not reparable	Replace control and cylinder.

Figure 3. Compressor Inlet Variable Vane Control And Cylinder - Inspection

Legend for figure 3 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
4. Threads -			
Broken, dented, or damaged	Not serviceable	Not reparable	Replace control and cylinder.
5. Mounting Lug -			
Cracked	Not serviceable	Not reparable	Replace control and cylinder.
6. Bearing -			
Radial play	Up to 0.010 inch	Not reparable	Replace control and cylinder.
Axial play	Up to 0.010 inch on spherical bearing	Not reparable	Replace control and cylinder.
Damaged	Not serviceable	Not reparable	Replace control and cylinder.
Frozen	Not servicable	Not reparable	Replace control and cylinder.
7. Receptacles J93 and J94 -			
Threads broken or dented	Not serviceable	Not reparable	Replace control and cylinder.
Pins broken, cracked, or missing	Not serviceable	Not reparable	Replace control and cylinder.
8. Electro hydraulic servo valve (EHV) -			
Check cover for flatness	Not serviceable	Not reparable	Replace EHV.

Legend for figure 3 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
9. Sleeve Nut -			
Cracked	Not serviceable	Not reparable	Replace nut.
10. Clevis -			
Cracked	Not serviceable	Not reparable	Replace clevis.
11. Cylinder rod -			
Check rod for freedom of movement throughout full travel of rod	Not serviceable if rod binds	Not reparable	Replace control and cylinder.
Damaged	Not serviceable	Not reparable	Replace control and cylinder.

7. COMPRESSOR INLET VARIABLE VANE CONTROL AND CYLINDER - INSTALLATION OF ATTACHING PARTS.

(See Figure 4 and Table 1.)

a. If required, remove corrosion preventive compound from cylinder by wiping with clean cloth moistened with P-D-680, Type II petroleum solvent.

b. Apply a light coat of PWA 36545 antigalling compound to threads of rod end clevis. Remove excess.

NOTE

First set of threads on end of clevis rod shall not show beyond end of cylinder rod.

c. Install sleeve nut on clevis beyond first set of threads.

d. Place key washer on clevis and thread clevis into cylinder rod of CIVV control and cylinder. See Table 1.

Table 1. Rod End Clevis Configuration

Clevis PN	Keywasher PN	Sleeve Nut Torque (Lb-in.)
4083038	4004816	135 to 165

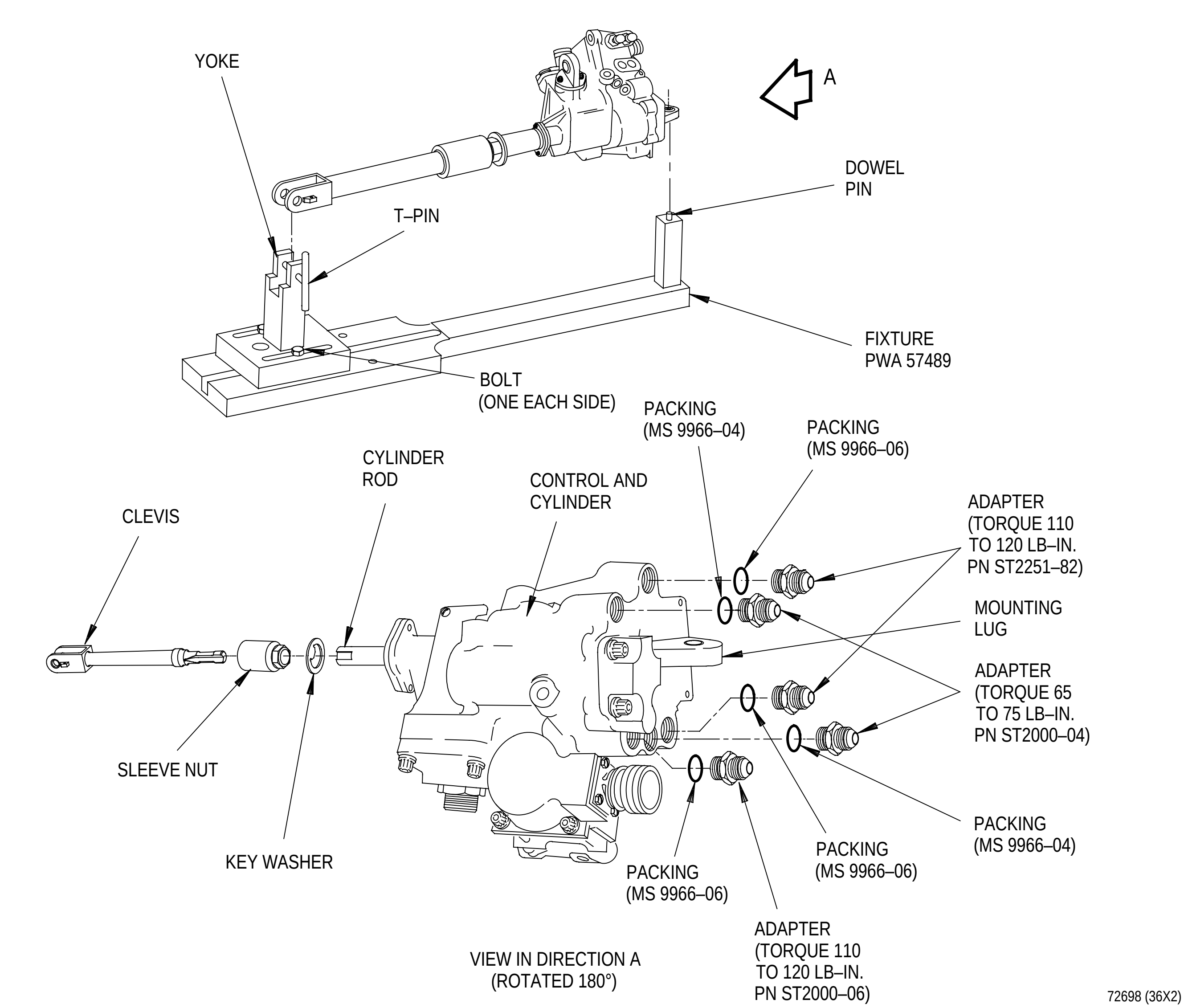


Figure 4. Compressor Inlet Variable Vane Control and Cylinder - Installation of Attaching Parts

e. Index control and cylinder to match compressor inlet synchronizing ring of engine as follows:

WARNING

Jet fuel may be expelled from actuator if the cylinder rod is moved while the manifold tubes are disconnected.

(1) Push cylinder rod into control and cylinder. Rod shall be in fully retracted position when doing the following steps.

(2) Ensure control and cylinder matches unit that is identified on tag of PWA 57489 fixture used in paragraph 3. If control and cylinder is a replacement unit, reidentify unit shown on tag of fixture.

(3) Ensure bolts of fixture are tight so that pad cannot be moved. If loose, preceed to paragraph 8. Remove T-pin from tagged PWA 57489 fixture.

(4) Place rear mounting lug of control and cylinder on dowel pin of fixture.

(5) Line up holes in clevis with holes in fixture yoke, by adjusting clevis rod, until T-pin can be inserted through yoke and clevis smoothly.

(6) Turn sleeve nut against cylinder rod. Thread on clevis shall not protrude beyond end of sleeve nut.

NOTE

Keywasher will be bent during rigging procedure.

(7) Torque sleeve nut. See Table 1. Do not bend key washer at this time.

(8) Remove control and cylinder from fixture. Remove identification tag from fixture. Replace T-pin in yoke of fixture.

NOTE

Control and cylinder may be clamped in a soft jawed vise for ease of installing adapters.

f. Lubricate packings with MIL-L-7808 oil or VV-P-236 petrolatum and install on adapters.

g. Lubricate threads of adapters with MIL-L-7808 oil.

h. Install adapters in ports of control and cylinder and torque. (See figure 4.)

8. COMPRESSOR INLET VARIABLE VANE CONTROL AND CYLINDER - INSTALLATION. (See Figure 5.)

a. Put a light coat of PWA 550 antigalling compound on bolt threads that connect CIVV control and cylinder to compressor stator inlet connecting link and to support.

b. Position control and cylinder in place on lower left side of inlet fan module(figure 5, Sheet 1) as follows:

(1) Install rear mounting lug between lugs of support.

(2) Position rod end clevis over front compressor stator bellcrank.

(3) Install lower lug in compressor stator inlet connecting link.

c. Install bolt, with head up, through support and rear mounting lug. Install nut and torque to 62 pound-inches. Continue torquing nut to a maximum of 72 pound-inches until cotter pin holes in nut line up with hole in bolt. Install PN MS9245-24 cotter pin.

d. Install bolt, head toward rear of engine, through compressor stator inlet connecting link and lower lug of control and cylinder. Install nut and torque 62 to 72 pound-inches.

e. Insert clevis pin, head outboard, through rod end clevis and front compressor stator bellcrank.

f. Install cotter pin through center of clevis pin hole. Bend ends of cotter pin.

g. Install retainer and place retainer notch in groove of clevis pin. Push retainer until it snaps. Ensure retainer tension is sufficient to obtain a snap fit.

h. Remove protective closures from electrical connectors. Connect connectors P93 and P94 to receptacles of control and cylinder as follows:

(1) Align keyways and handtighten connector.

(2) Ensure red line on receptacle is not visible when viewed at right angles.

(3) Tighten connector firmly with soft-jawed pliers.

i. Remove protective closures from tubes that connect to control and cylinder. Put a light coat of PWA 550 antigalling compound on threads of manifold and tube coupling nuts. Remove excess.

j. Connect tubes to control and cylinder. Torque coupling nuts. Refer to figure 5, Sheet 2.

k. If necessary, or if PWA 57489 fixture was loose in paragraph 7, step e.(2), rig CIVV control and cylinder. Refer to T.O. 2J-F100-53-6, WP 705 00.

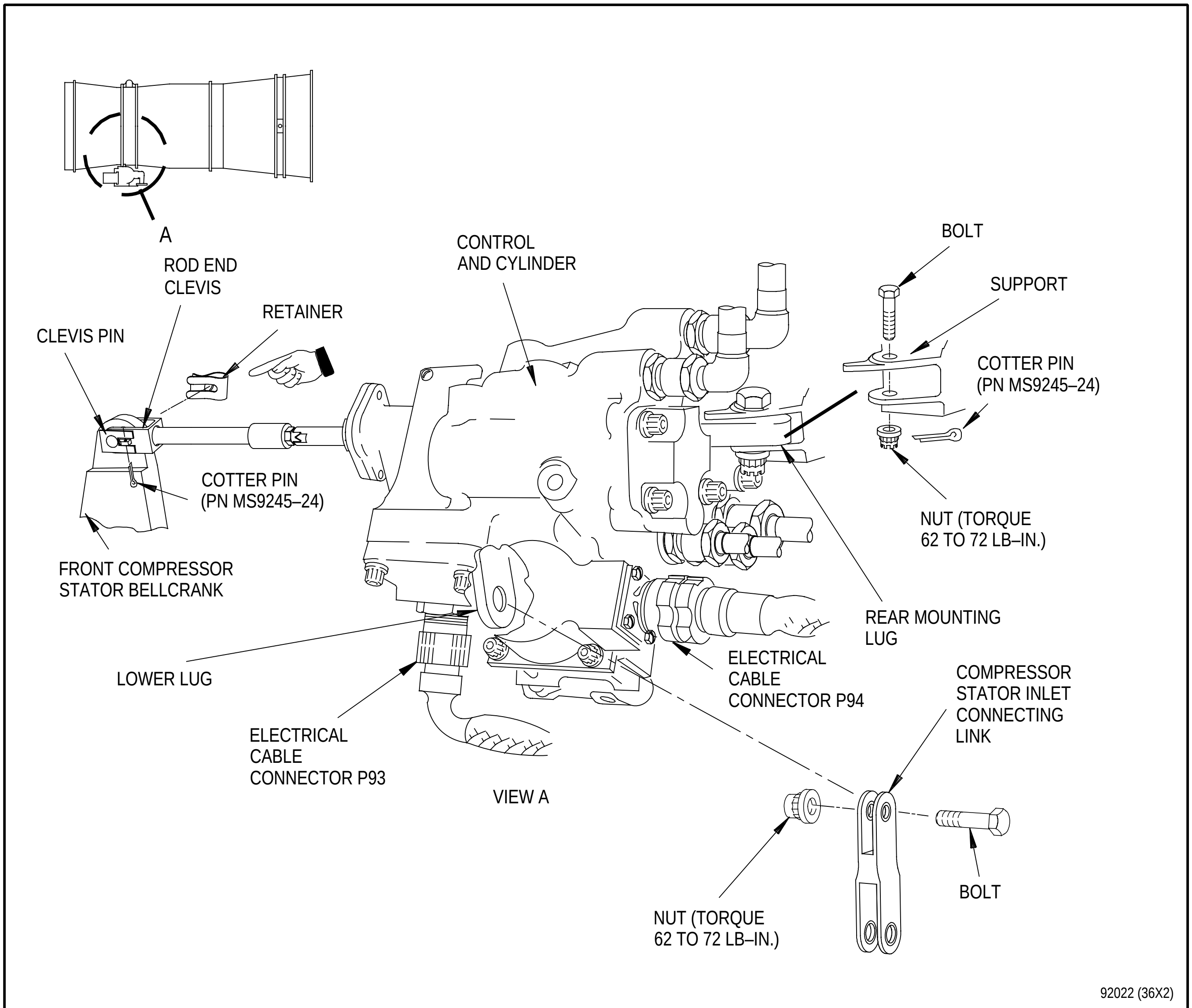


Figure 5. Compressor Inlet Variable Vane Control and Cylinder - Installation (Sheet 1 of 2)

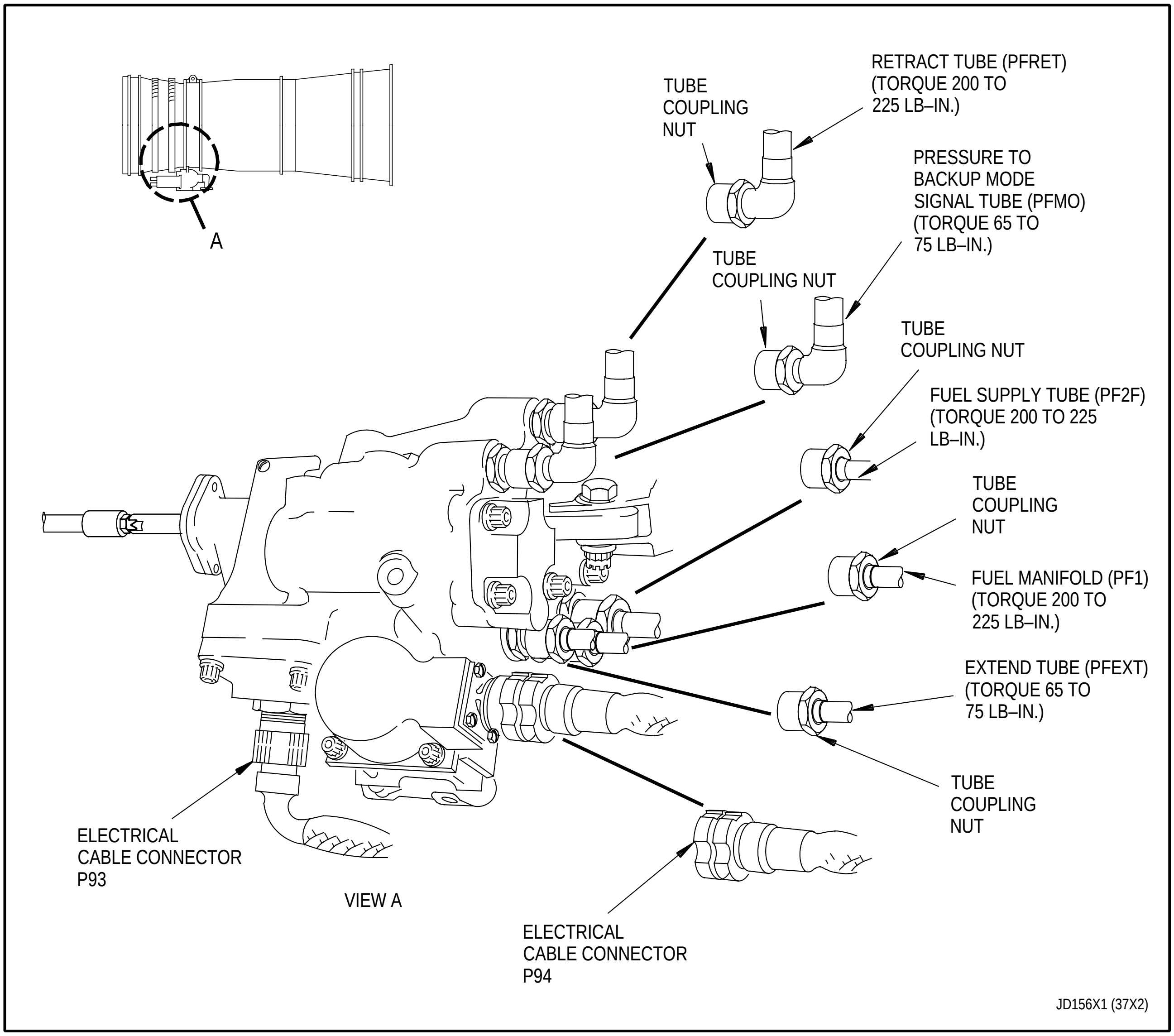


Figure 5. Compressor Inlet Variable Vane Control and Cylinder - Installation (Sheet 2 of 2)

9. COMPRESSOR INLET VARIABLE VANE CONTROL AND CYLINDER ELECTRO-HYDRAULIC SERVO VALVE - REPLACEMENT.
(See Figure 6.)

CAUTION

Contamination of the CIVV control and cylinder will make it unserviceable. Ensure all maintenance is done in a clean area.

a. Place CIVV control and cylinder on a clean work bench so electro-hydraulic servo valve can be easily removed. If control is mounted on engine, disconnect electrical connector P94.

b. Clean area around EHV with P-D-680, Type II petroleum solvent. Blow area dry with clean compressed air at less than 30 psig.

c. Put a bucket under control to catch any fuel as EHV is being removed.

d. Remove screws(2, figure 6) and washers(3). Remove EHV(1). Remove and discard packings(4).

e. Remove replacement EHV(1) from Bendix PN 351005 parts kit. Remove all protective closures from EHV.

f. Lubricate new packings(4) with VV-P-236 petrolatum. Install on EHV(1).

g. Install EHV(1) on control, engaging alignment pin in control with hole in EHV. Secure with washers(3) and screws(2) fingertight.

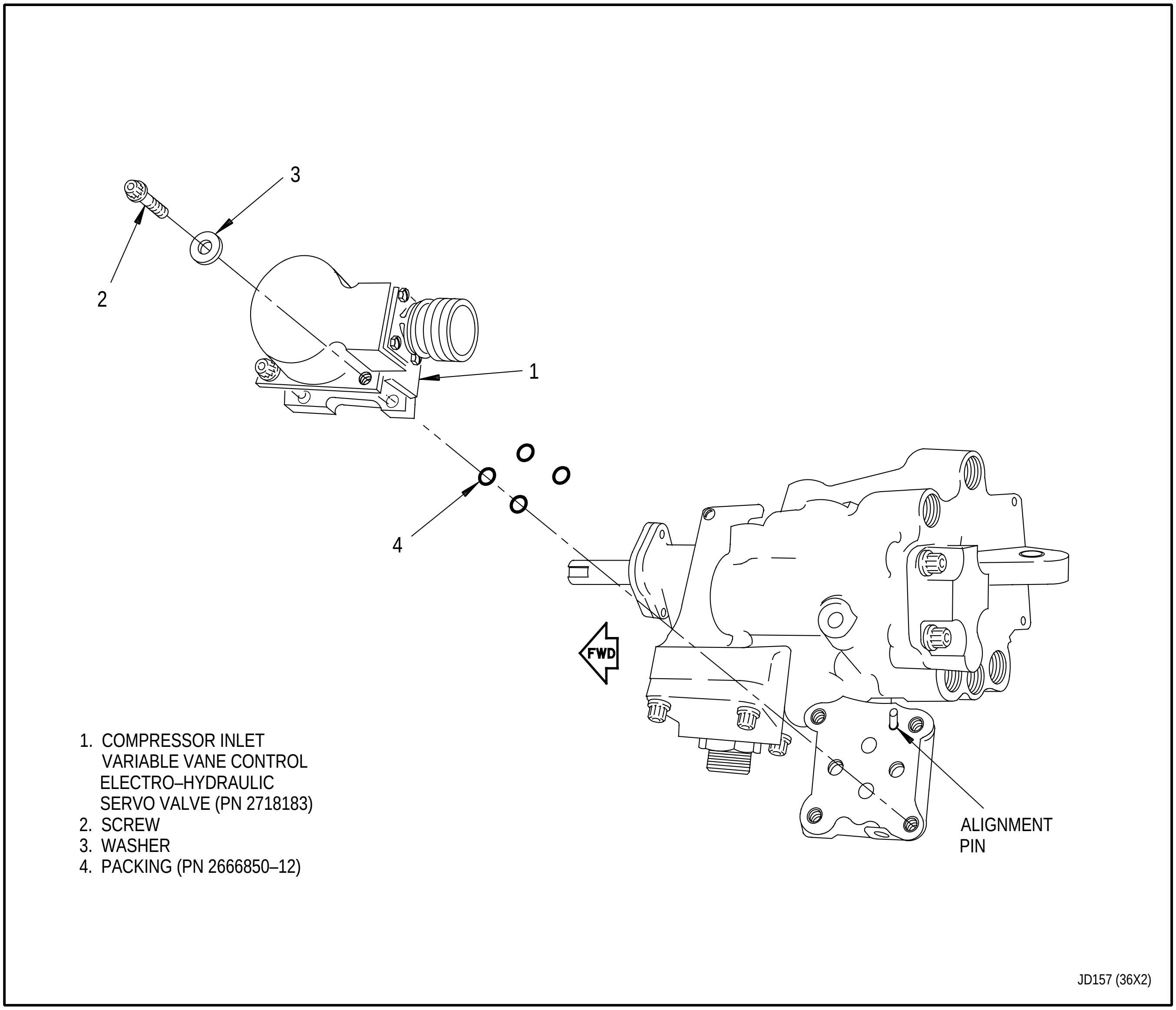


Figure 6. Compressor Inlet Variable Vane Control Electro-Hydraulic Servo Valve - Replacement

h. Record torque required to thread screw. Torque shall be between 2 to 18 pound-inches.

i. If run-in torque cannot be met, replace screw and check run-in torque. If it still cannot be met, replace control.

j. Torque screw 20 to 25 pound-inches above torque recorded in step h. in 5 pound-inch increments, alternately to each screw until total torque is applied.

k. If control is mounted on engine, connect electrical cable connector P94 to mating receptacle on EHV as follows:

(1) Align keyways and handtighten connector.

(2) Ensure red line on receptacle is not visible when viewed at right angles.

(3) Tighten connector firmly with soft-jawed pliers.

l. If control is mounted on engine, a leak check shall be performed. Refer to T.O. 2J-F100-11-2, WP 302 00.

m. Preserve unserviceable EHV by completely filling it with MIL-L-6081, Grade 1010, 10 micron filtered oil. Do not immerse or oil flush electrical connector. Pour out approximately 1/4 of the oil.

n. Install protective closures from replacement kit on unserviceable EHV and pack it in shipping container.

10. COMPRESSOR INLET VARIABLE VANE CONTROL AND CYLINDER - LEAK CHECK.

a. Using plugs and packing, cap Pfret and Pfext ports.

b. Leave Pfmo port open.

c. Install PN 2564606-11 fluid inlet adapter fitting with PN 2564606-0 packing on Pf2f inlet port.

d. Install PN 2564606-11 fluid outlet adapter fitting with PN 2564606-0 packing on Pf1 port.

e. Thoroughly wipe exterior of CIVV control and cylinder with clean cloth moistened with petroleum solvent.

f. Dry control with clean, compressed air regulated to less than 30 psig.

g. Connect PWA 50096 tester, containing MIL-L-6081, Grade 1010 oil, MIL-C-7024, Type II calibration fluid or jet fuel, to control as follows:

(1) Connect extend hose to Pf2 port.

(2) Connect retract hose to Pf1 port.

NOTE

Refer to T.O. 33D29-3-6-1 for PWA 50045 hydraulic cart operating instructions and to T.O. 33D4-6-617-1 for PWA 50096 test equipment operating instruction.

h. Leak check control at 40 to 60 psig for 5 minutes.

i. If oil leaks from Pfmo port, shutdown hydraulic cart immediately. Check pressure level of hydraulic cart. If less than 50 psig, reject CIVV control and cylinder.

j. Check the control module that has been replaced. No leakage is allowed between module and control mating points. If control is leaking, shutdown hydraulic cart and replace or repair unit as necessary.

k. Remove hoses from oil inlet and outlet adapter fittings.

l. Slowly remove Pf2f adapter and adapter fitting. Allow any residual pressure to bleed from control.

m. Remove Pfret and Pfext fuel port caps if required.

n. Drain residual oil from control if required.

o. Cap all open fuel pressure ports if required.

11. COMPRESSOR INLET VARIABLE VANE CONTROL AND CYLINDER - PRESERVATION FOR STORAGE AND SHIPMENT.

NOTE

- Preservation is required when a unit is returned to depot or stored for more than 30 days. Units returned for teardown investigation will be preserved, unless the service report disposition instructions advise otherwise.
- The following instructions shall be complied with prior to storing and shipping CIVV linear actuating cylinder to avoid accessory contamination or damage.

a. Drain residual fuel from fittings and ports.

b. Ensure attaching parts are removed. Refer to paragraph 4.

NOTE

Refer to T.O. 3D4-6-617-1 PWA 50096 hydraulic pressure tester for operating instructions on use of cart.

c. Connect EXTEND hose from PWA 50096 tester, containing MIL-L-6081 engine oil, to PFEXT port using fitting.

d. Connect RETRACT hose from PWA 50096 tester, to PFRET port using fitting.

e. Apply 45 to 55 psig pressure to cylinder.

f. Operate selector valve on tester to EXTEND position, then to OFF, then to RETRACT position, then to OFF. Repeat this cycle three times.

g. Reduce pressure to zero. Remove lines and fittings.

h. Manually extend and retract actuating rod on cylinder until excess fluid is displaced. Leave actuating rod in retracted position.

i. Install protective closures.

j. Depreserve control by substituting PMC 9041 for MIL-L-6081C following the procedures in steps c through i.

12. COMPRESSOR INLET VARIABLE VANE CONTROL AND CYLINDER - FOLLOW ON MAINTENANCE.

a. Install engine diagnostic unit per WP 023 00.

WORK PACKAGE

TECHNICAL PROCEDURES

CYLINDER - ACTUATING, LINEAR, VARIABLE VANE, COMPRESSOR INLET

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 16

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2	28	8	28	10	0
3	17	8A Added	17	11	22
4	0	8B Blank Added	17	12 - 13	0
5	22	9	17	14 Blank	8
6 - 7	5				

REFERENCE MATERIAL REQUIRED

Title	Number
Inlet/Fan Module	T.O. 2J-F100-53-6
Compressor Inlet Variable Vane (CIVV) Cylinder System - Rigging	WP 705 00
Hydraulic Pressure Tester PWA 50096	T.O. 33D4-6-617-1

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

T. O. No.	Date	Level	Title (ECP No.)
2J-F100229(I)-516	30 NOV 96	O/I	Replacement of PN 4075565 and PN 4075566 Compressor Inlet Variable Vane (CIVV) Actuator Rod Clevises, F100-PW-229 Engines, F-15 Aircraft. (ECP 95QA027)

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
CLOTH, LINT-FREE	-
COMPOUND, ANTIGALLING (PWA 36545)	ESNALUBE 382
COMPOUND, ANTIGALLING, (PWA 550)	HI-T-650 OR LUBRI-BOND HT
OIL, LUBRICATING OR	MIL-L-7808
OIL, LUBRICATING	MIL-L-6081, GRADE 1010
PETROLATUM	VV-P-236
SOLVENT, PETROLEUM	P-D-680, TYPE II

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
KEY WASHER	4004816	1
PACKING, PREFORMED	MS9966-04	1
PACKING, PREFORMED	MS9966-06	1
PIN, COTTER	MS9245-24	2
RETAINER	4075643	1

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
3,6	Compressor Inlet Variable Vane Linear Actuating Cylinder - Removal/Installation of Attaching Parts	
	Fixture - Positioning, Variable Guide Vane Actuator -------------------------	PWA 57489
8	Compressor Inlet Variable Vane Linear Actuating Cylinder - Storage and Shipment	
	Hydraulic Pressure Tester --------------	PWA 50096

ILLUSTRATED SUPPORT EQUIPMENT

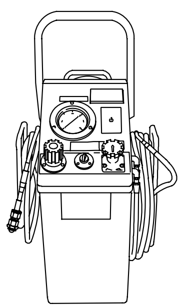

PWA 50096 –C

Figure T1. PWA 50096 Tester

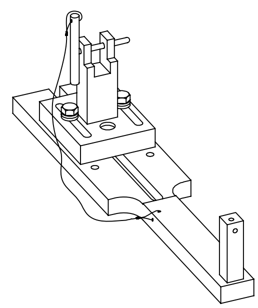

PWA 57489 –C

Figure T2. PWA 57489 Fixture

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures for the compressor inlet variable vane (CIVV) linear actuating cylinder:

- Removal
- Removal of attaching parts
- Cleaning
- Inspection
- Installation of attaching parts
- Installation
- Storage and shipment

2. COMPRESSOR INLET VARIABLE VANE LINEAR ACTUATING CYLINDER - REMOVAL.
(See Figure 1.)

WARNING

Jet fuel may be expelled from actuator if the cylinder rod is moved while the manifold tubes are disconnected.

a. Disconnect retract and extend tubes from CIVV linear actuating cylinder by loosening tube coupling nuts. Install protective closures. (See figure 1.)

b. Remove retainer, cotter pin, and clevis pin holding rod end clevis to front compressor stator bellcrank. Discard cotter pin.

c. Remove cotter pin, nut, and bolt holding cylinder to support. Remove cylinder. Discard cotter pin.

d. Purge fuel from actuating cylinder.

e. Install protective closures on all open ports.

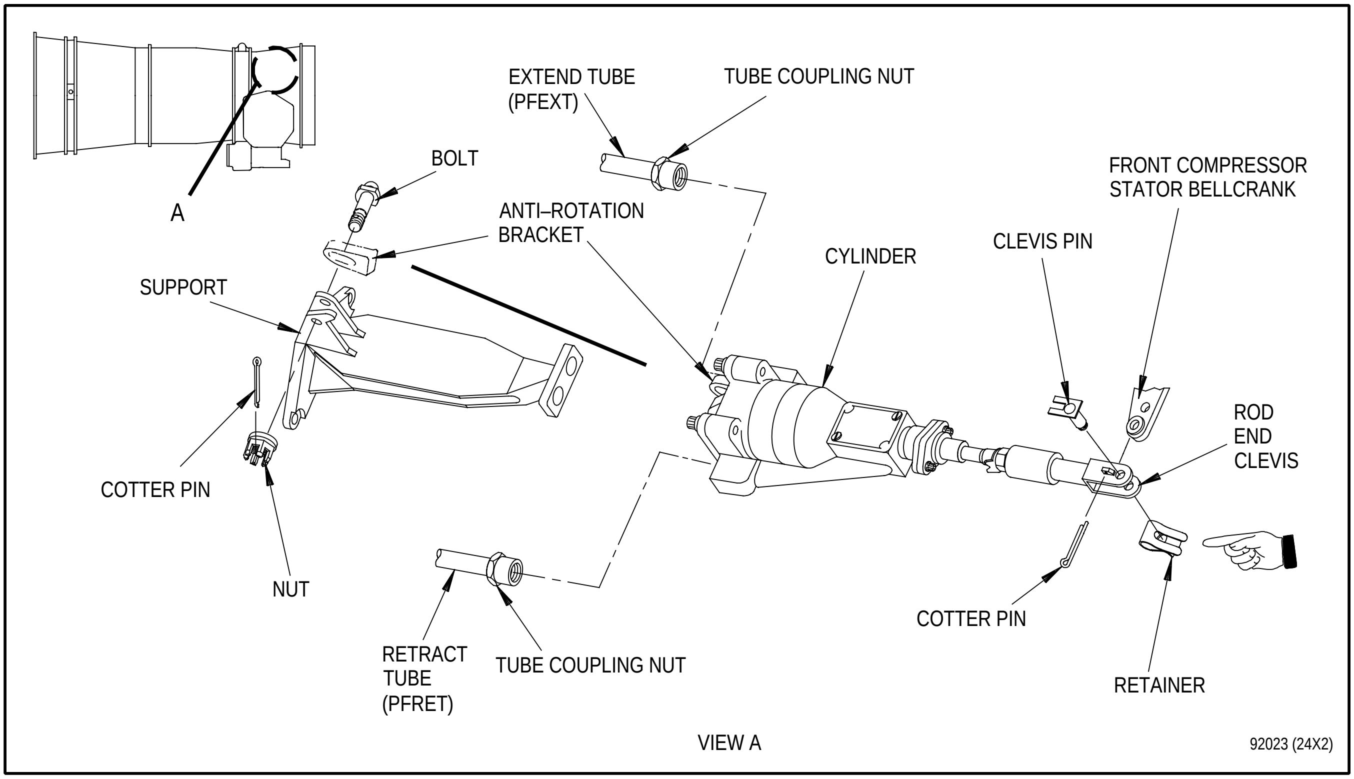


Figure 1. Compressor Inlet Variable Vane Linear Actuating Cylinder - Removal

3. COMPRESSOR INLET VARIABLE VANE LINEAR ACTUATING CYLINDER - REMOVAL OF ATTACHING PARTS.
(See Figure 2.)

NOTE

CIVV linear actuating cylinder is rigged to front compressor inlet synchronizing ring. Index cylinders retracted length, using specified fixture, before disassembling.

a. Loosen bolts on PWA 57489 fixture. Remove T-pin from fixture yoke.

WARNING

Jet fuel may be expelled from actuator if the cylinder rod is moved while the manifold tubes are disconnected.

b. Push cylinder rod into CIVV linear actuating cylinder as far as it will go.

c. Place cylinder rear mounting lug on dowel pin of fixture.

d. Position rod end clevis of cylinder in yoke of fixture. Move yoke pad, as required, until T-pin can be inserted through yoke and clevis smoothly.

e. Lock pad in place by tightening bolts.

f. Make notation on tag identifying fixture by CIVV and engine serial numbers. Fixture is not to be reset until cylinder has been adjusted. Tag fixture.

g. Remove T-pin from yoke, and remove cylinder from fixture. Replace T-pin in yoke.

NOTE

Cylinder may be clamped in a soft jawed vise for ease of removing adapters.

h. Remove adapters and packings from cylinder. Install protective closures in ports and discard packings.

i. Remove rod end clevis, sleeve nut, and key washer from cylinder. Discard key washer.

j. Retain sleeve nut and clevis.

k. Refer to paragraph 8 for storage and shipment.

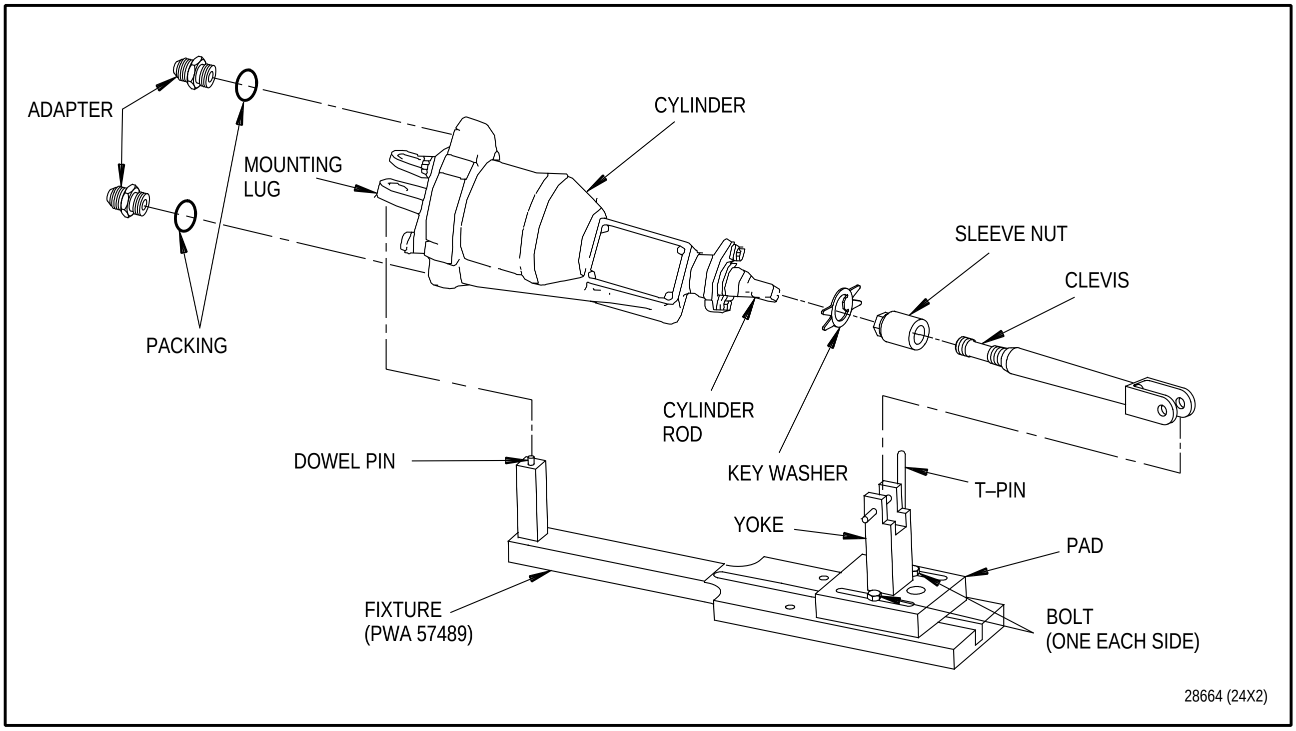


Figure 2. Compressor Inlet Variable Vane Linear Actuating Cylinder - Removal of Attaching Parts

4. COMPRESSOR INLET VARIABLE VANE LINEAR ACTUATING CYLINDER - CLEANING.

a. Using a clean cloth moistened with P-D-680, Type II petroleum solvent, wipe exterior of cylinder.

b. Wipe cylinder dry with clean, dry lint-free cloth.

5. COMPRESSOR INLET VARIABLE VANE LINEAR ACTUATING CYLINDER - INSPECTION.

a. Visually examine threaded areas of CIVV linear actuating cylinder for damaged threads. Replace cylinder having broken or dented threads.

b. Inspect exterior of cylinder for cracks. Replace cylinder, if cracked.

WARNING

Jet fuel may be expelled from actuator if the cylinder rod is moved while the manifold tubes are disconnected.

c. Check piston and rod for freedom of movement throughout full travel of rod. If rod binds, replace cylinder.

d. Check mounting lug for cracks. If cracked, replace cylinder.

e. Inspect bearing for the following:

(1) Radial play up to 0.010 inch. Replace cylinder, if limit is exceeded.

(2) Axial play up to 0.010 inch on spherical bearing. Replace cylinder, if limit is exceeded.

(3) Damaged or frozen bearing. Replace cylinder, if bearing is damaged or frozen.

6. COMPRESSOR INLET VARIABLE VANE LINEAR ACTUATING CYLINDER - INSTALLATION OF ATTACHING PARTS.

(See Figure 3 and Table 1.)

a. If required, remove corrosion preventive compound from actuating cylinder by wiping with clean cloth moistened with P-D-680, Type II petroleum solvent.

b. Apply a light coat of PWA 36545 antigalling compound on threads of clevis rod. Remove excess.

NOTE

First set of threads on end of clevis rod shall not show beyond end of cylinder rod.

c. Install sleeve nut on clevis rod as far as it will go.

d. Place key washer on clevis and thread clevis into cylinder rod of cylinder. See Table 1.

Table 1. Rod End Clevis Configuration

Clevis PN	Keywasher PN	Sleeve Nut Torque (Lb-in.)
4083039	4004816	135 to 165

e. Index cylinder to match compressor inlet synchronizing ring of engine as follows:

WARNING

Jet fuel may be expelled from actuator if the cylinder rod is moved while the manifold tubes are disconnected.

(1) Push cylinder rod into cylinder as far as it will go.

(2) Ensure cylinder is the same unit that is identified on tag of PWA 57489 fixture used in paragraph 3. If cylinder is a replacement unit, reidentify unit shown on tag of fixture.

(3) Ensure bolts of fixture are tight so pad cannot be moved. If bolts are loose, refer to paragraph 7. Remove T-pin from tagged PWA 57489 fixture.

(4) Place cylinder rear mounting lug on dowel pin of fixture.

(5) Line up holes in clevis with holes in fixture yoke, by adjusting clevis rod, until T-pin can be inserted through yoke and clevis smoothly.

(6) Turn sleeve nut against cylinder rod. Thread on clevis shall not protrude beyond end of sleeve nut.

NOTE

Keywasher will be bent during rigging procedure.

(7) Torque sleeve nut. See Table 1. Do not bend key washer at this time.

(8) Remove cylinder from fixture. Remove identification tag from fixture. Replace T-pin in yoke of fixture.

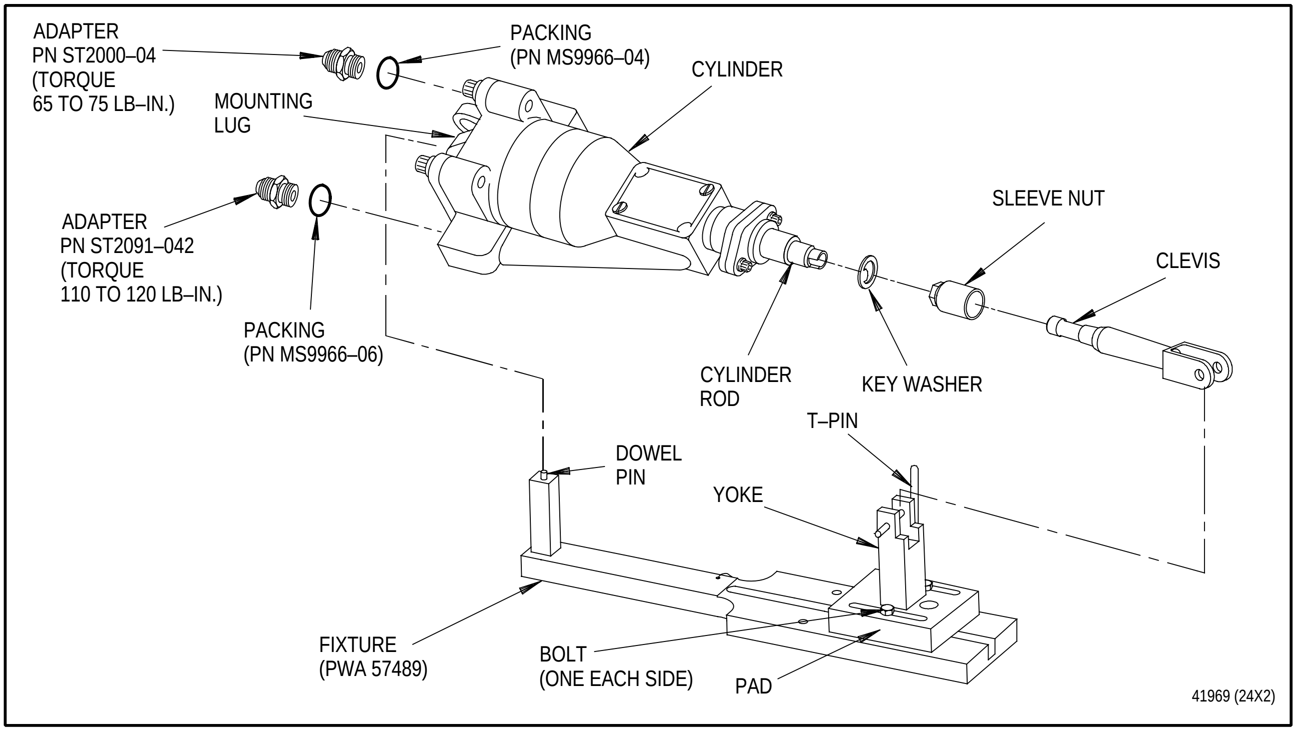


Figure 3. Compressor Inlet Variable Vane Linear Actuating Cylinder - Installation of Attaching Parts

f. Lubricate one PN MS9966-04 and one PN MS9966-06 packing with a light coat of MIL-L-7808 oil or VV-P-236 petrolatum. Install packings on shorter ends of adapters.

g. Lubricate threads of adapters with MIL-L-7808 oil.

h. Install adapters and packings in ports on back of cylinder. Torque adapters. (See figure 3.)

7. COMPRESSOR INLET VARIABLE VANE LINEAR ACTUATING CYLINDER - INSTALLATION.
(See Figure 4.)

a. Put a light coat of PWA 550 antigalling compound on bolt thread that connects CIVV linear actuating cylinder to support.

b. Position cylinder in place with anti-rotation bracket toward top of engine, mounting lug on back of cylinder between lugs of support, and front compressor stator bellcrank between rod end clevis.

c. Install bolt, head upward, through support and mounting lug of cylinder. Install nut and torque to low limit of 62 pound-inches. Continue torquing nut to a maximum of 72 pound-inches until cotter pin holes in nut line up with holes in bolt. Install PN MS9245-24 cotter pin.

NOTE

If alignment key on clevis does not face outward, turn piston. Do not adjust clevis.

d. Insert clevis pin, head outboard, through rod end clevis and front compressor stator bellcrank. (See figure 4.)

e. Install cotter pin through center of clevis pin hole. Bend ends of cotter pin.

f. Install retainer, and place retainer notch in groove of clevis pin. Push retainer until it snaps. Ensure retainer tension is sufficient to obtain a snap fit.

g. Remove protective closures from retract and extend tubes. Put a light coat of PWA 550 antigalling compound on threads of tube coupling nuts. Remove excess.

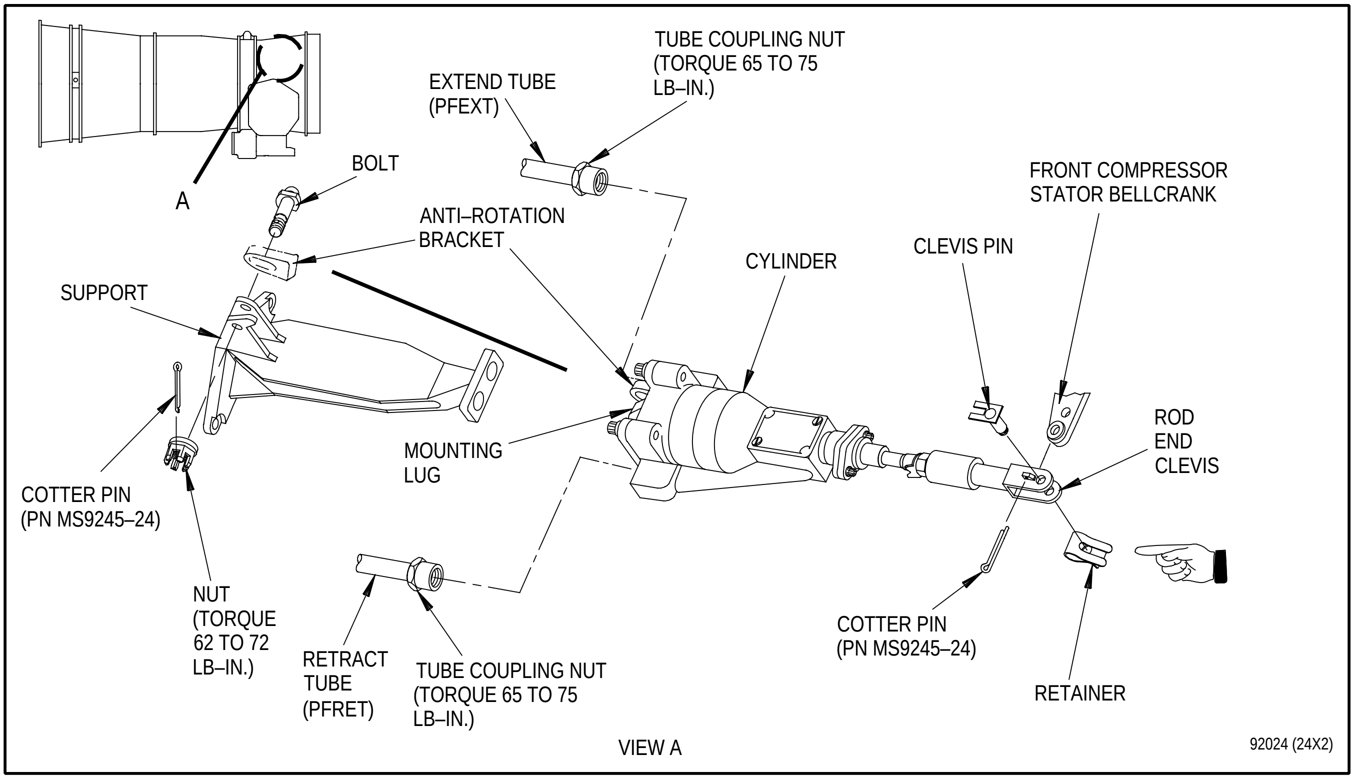


Figure 4. Compressor Inlet Variable Vane Linear Actuating Cylinder - Installation

h. Connect retract tube to lower port (PFRET) on back of cylinder. Torque tube coupling nut 65 to 75 pound-inches.

i. Connect hydraulic pressure extend tube to upper port (PFEXT) on back of cylinder. Torque tube coupling nut 65 to 75 pound-inches.

j. If necessary, or if PWA 57489 fixture was loose in paragraph 6, step d.2, rig CIVV cylinder and control. Refer to T.O. 2J-F100-53-6, WP 705 00.

8. COMPRESSOR INLET VARIABLE VANE LINEAR ACTUATING CYLINDER - STORAGE AND SHIPMENT.

a. Drain all residual fuel from fittings and ports.

b. Ensure attaching parts are removed. Refer to paragraph 3.

NOTE

Refer to T.O. 3D4-6-617-1 PWA 50096 hydraulic pressure tester for operating instructions on use of cart.

c. Connect EXTEND hose from PWA 50096 tester, containing MIL-L-6081 engine oil, to PFEXT port using fitting.

d. Connect RETRACT hose from PWA 50096 tester to PFRET port using fitting.

e. Apply 45 to 55 psig pressure to cylinder.

f. Operate selector valve on tester to EXTEND position, then to OFF, then to RETRACT position, then to OFF. Repeat this cycle three times.

g. Reduce pressure to zero. Remove lines and fittings.

h. Manually extend and retract actuating rod on cylinder until excess fluid is displaced. Leave actuating rod in retracted position.

i. Install protective closures.

CAUTION

Do not water wash or dip accessory in solvent or severe internal damage may occur.

j. Wipe exterior of cylinder with clean cloth moistened with P-D 680, Type II petroleum solvent, and dry with lint-free cloth.

k. If cylinder will be shipped, pack in a shipping container. Use original container if possible. Cushion cylinder with shock absorbing material.

WORK PACKAGE

TECHNICAL PROCEDURES

CYLINDER - ACTUATING, LINEAR, COMPRESSOR BLEED

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 14

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	21	8 - 9	0	11 - 13	0
2 - 6	0	10	1	14 Blank	1
7	21				

REFERENCE MATERIAL REQUIRED

Title	Number
Engine Accessories and Rigging Procedures -------------	T.O. 2J-F100-53-4
Table of Limits and Clearance Charts ----------------	WP 200 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Cloth, lint-free	-
Compound, antigalling (PWA 550)	Hi-T-650 or Lubri-Bond HT
Compound, antigalling (PWA 36545)	Everlube 382
Lubricant, dry film (PMC 1714)	MIL-L-8937
Oil, lubricating	MIL-L-6081, Grade 1010
Oil, lubricating or	MIL-L-7808
Petrolatum	VV-P-236
Solvent, petroleum	P-D-680, Type II
Tape, moisture proof	-

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Packing, preformed	MS9386-226	1
Packing, preformed	MS9966-04	1
Packing, preformed	MS9966-06	2

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures for the compressor bleed linear actuating cylinder:

- Removal
- Removal of attaching parts
- Cleaning
- Inspection
- Metal seal ring - Inspection
- Installation of attaching parts
- Installation
- Storage and shipment

2. COMPRESSOR BLEED LINEAR ACTUATING CYLINDER - REMOVAL.
(See Figure 1.)

a. Disconnect fuel drain tube from lower adapter of compressor bleed cylinder.

b. Disconnect compressor bleed cylinder PFSBC and PFSBO tubes from two upper adapters of the cylinder.

c. Install a length of standard flex hose on fuel fittings marked PFSBO and PFSBC before actuating cylinder. Provide container for fuel to drain into.

d. Remove nuts(8, figure 1) securing cylinder to fan duct.

WARNING

Fuel may be expelled from actuator under high pressure, if cylinder rod is moved while manifold tubes are disconnected.

e. Firmly grip actuator by hand. Pull actuator outward as far as possible to gain access to attaching bolt(10).

f. Carefully remove bolt(10) and nut(7).

g. Remove cylinder(9) and packing(6). Discard packing(6).

h. Remove retainer(5), seal ring holder(4), seal ring(3), and plate(2).

i. Remove support rods(1) from bleed actuator bracket, if required.

j. Place protective closures on tubes.

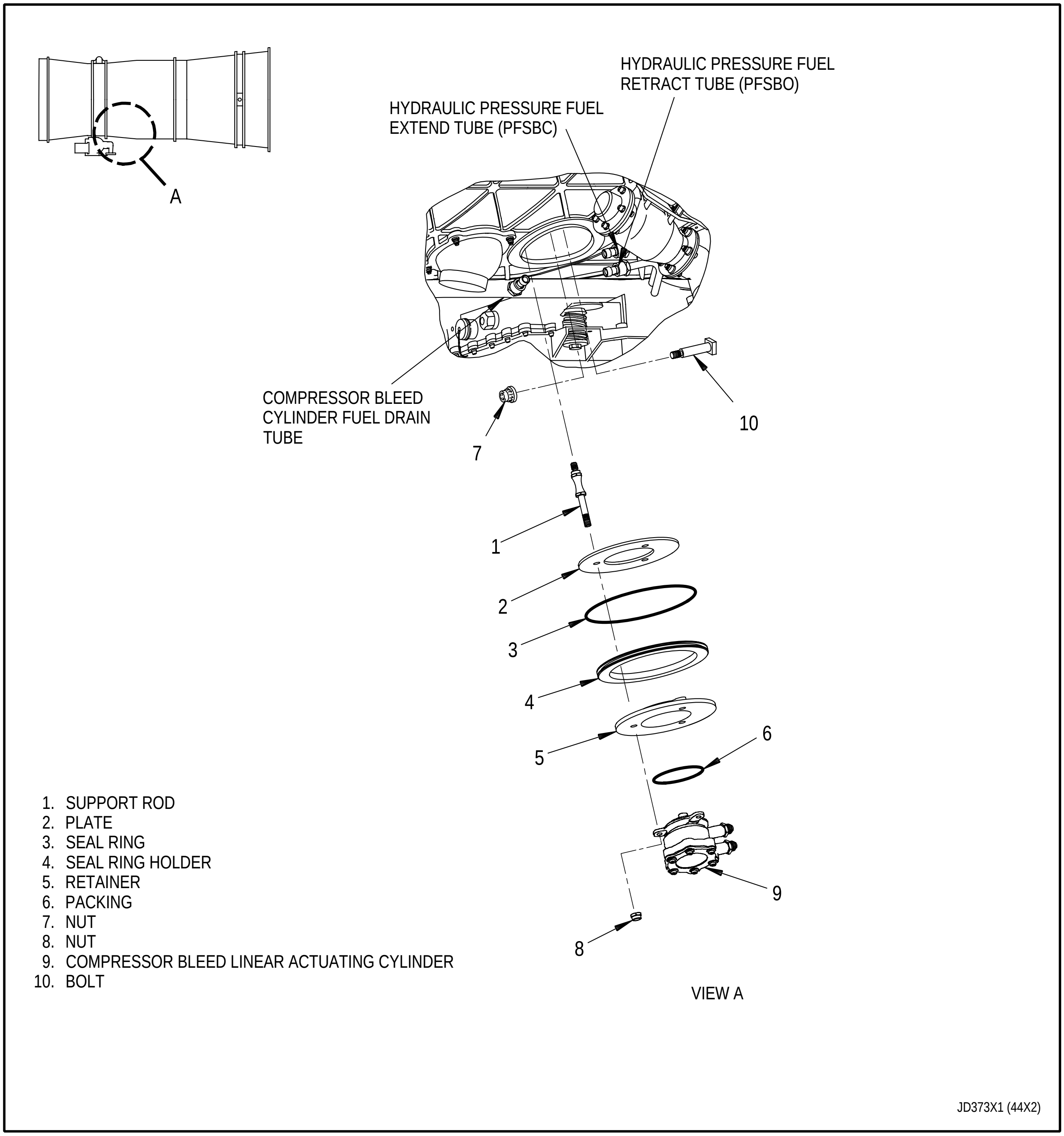


Figure 1. Compressor Bleed Linear Actuating Cylinder - Removal

3. COMPRESSOR BLEED LINEAR ACTUATING CYLINDER - REMOVAL OF ATTACHING PARTS.
(See Figure 2.)

a. Remove adapters from compressor bleed linear actuating cylinder. Remove and discard packings. (See figure 2.)

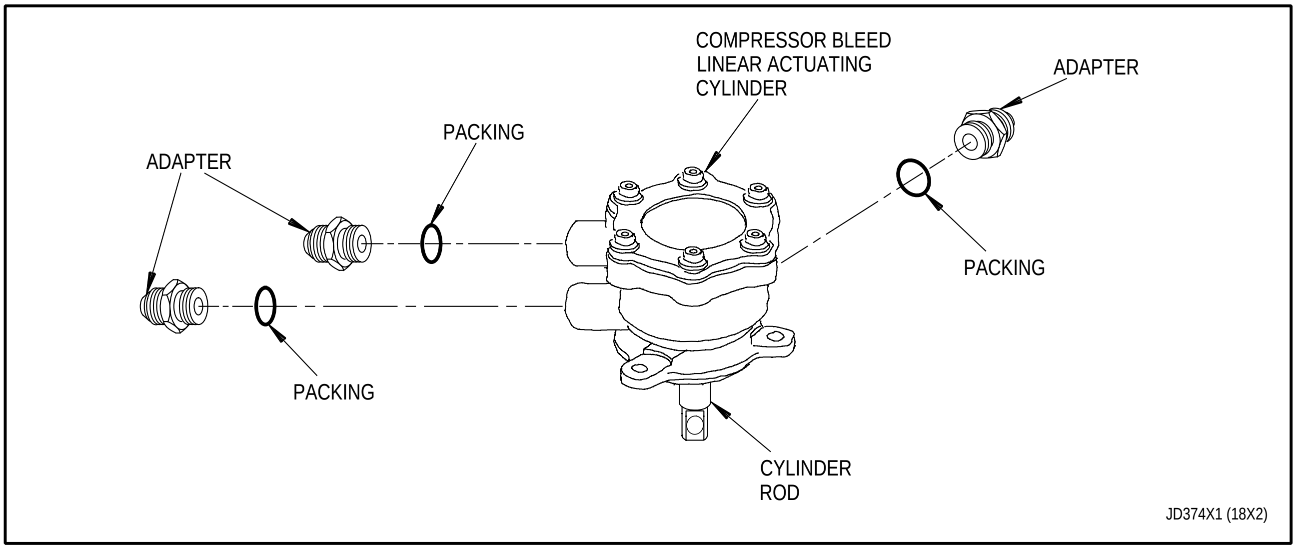


Figure 2. Compressor Bleed Linear Actuating Cylinder - Removal of Attaching Parts

4. COMPRESSOR BLEED LINEAR ACTUATING CYLINDER - CLEANING.

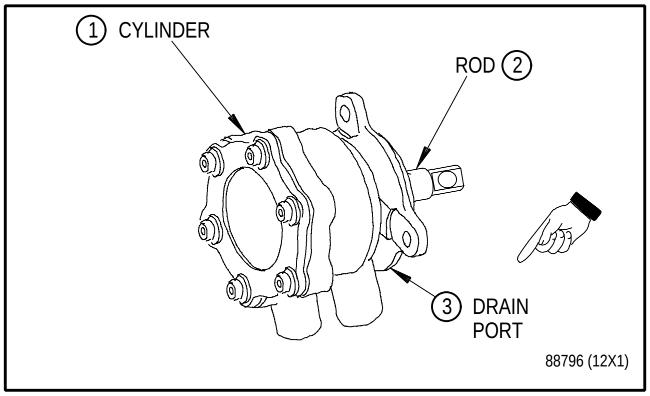
a. Using a clean cloth moistened with P-D-680, Type II petroleum solvent, wipe the outside of compressor bleed cylinder and bleed valve strap cylinder support assembly, if removed.

b. If fuel leakage through drain port noted, extend rod and wipe clean using cloth moistened with P-D-680. Retract rod.

c. Wipe components dry with clean, lint-free cloth.

5. COMPRESSOR BLEED LINEAR ACTUATING CYLINDER - INSPECTION.
(See Figure 3.)

a. Inspect compressor bleed cylinder. (See figure 3.)



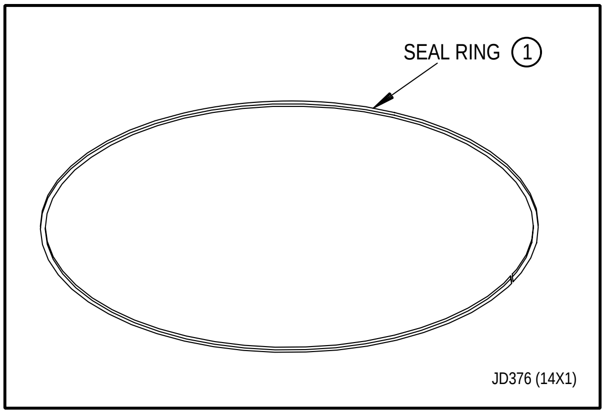
Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Cylinder -			
Dents, nicks, cracks	Not serviceable	Not reparable	Replace cylinder.
2. Rod -			
Binding	Not serviceable	Not reparable	Replace cylinder.
3. Drain port -			
Leakage	Serviceable, 1 drop/5 min.	See corrective action	Clean rod per step b.

Figure 3. Compressor Bleed Linear Actuating Cylinder - Inspection

6. METAL SEAL RING - INSPECTION.
(See Figure 4.)

a. Inspect seal ring.
(See figure 4.)

b. Inspect seal ring. Refer to WP 200 00 Table of Limits, References 1668 and 1669. Replace seal ring if it is not within these limits.



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Seal ring -			
Scratches with raised edges	Not serviceable	Not reparable	Replace seal ring.

Figure 4. Metal Seal Ring - Inspection

7. COMPRESSOR BLEED LINEAR ACTUATING CYLINDER - INSTALLATION OF ATTACHING PARTS.
(See Figure 5.)

a. Lubricate two PN MS9966-06 packings, one PN MS9966-04 packing, and adapters with a light coat of MIL-L-7808 oil or VV-P-236 petrolatum.

b. Install PN MS9966-06 packings on ends of two adapters that go into two upper ports of cylinder. (See figure 5.)

c. Install PN MS9966-04 packing on end of adapter that goes into lower port of cylinder.

d. Install adapters in two upper ports of cylinder. Torque adapters to 110 to 120 pound-inches.

e. Install adapter in lower port of cylinder. Torque adapter 65 to 75 pound-inches.

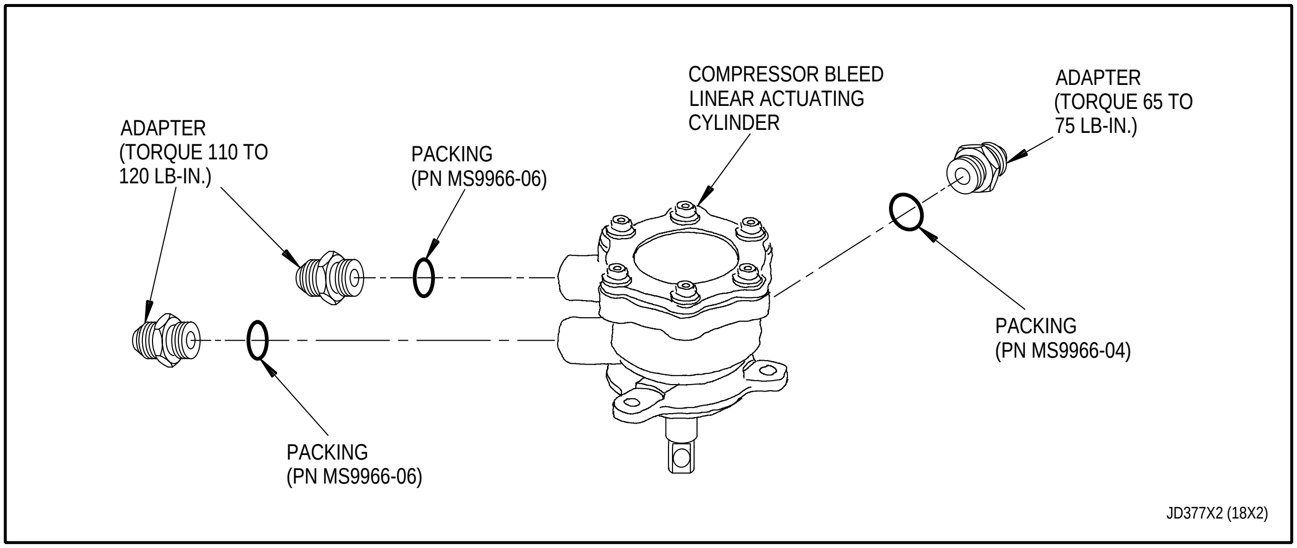


Figure 5. Compressor Bleed Linear Actuating Cylinder - Installation of Attaching Parts

8. COMPRESSOR BLEED LINEAR ACTUATING CYLINDER - INSTALLATION.
(See Figure 6.)

a. Lubricate nuts(7 and 8, figure 6) using PWA 36545 antigalling compound.

b. Lubricate short section of threads on support rods(1), using MIL-L-7808 oil.

c. Thread short section of threads of support rods(1) into bleed actuator bracket located through hole in fan duct. Torque 65 to 85 pound-inches.

d. Install metal seal ring(3) on seal ring holder(4).

e. Lubricate packing(6) using a light coat of VV-P-236 petrolatum. Install packing(6) into groove of actuator(9).

f. Carefully install retainer(5) onto actuator(9) ensuring pin on retainer faces outward, away from engine.

g. Loosely install seal ring holder(4) with metal seal ring(3), and plate(2) onto actuator(9).

h. Install a length of standard flex hose on fuel fittings marked PFSBO and PFSBC before actuating cylinder.

i. Extend actuator shaft completely by hand.

j. Ensure connecting link scissor that actuator attaches to inside fan duct is extended fully outward.

k. Position actuator and seal assembly over supports(1) aligning hole in actuator shaft with hole in connecting link scissors.

l. Install protective covering under bleed actuator. Install slab head bolt(10) through connecting link and actuator shaft. Remove covering.

m. Move actuator over holding bolt in position and install lubricated nut(7). Torque nut 62 to 72 pound-inches.

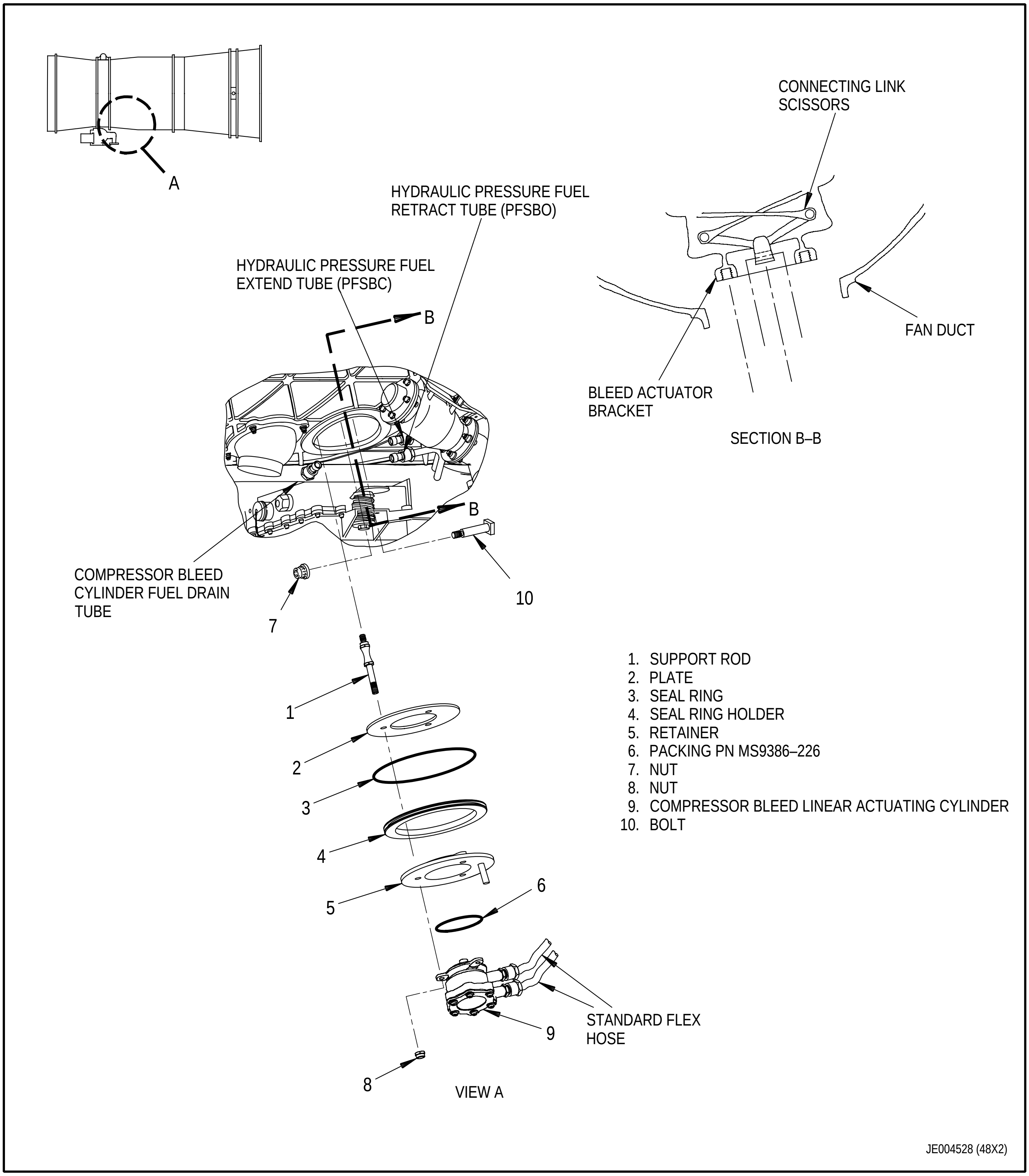


Figure 6. Compressor Bleed Actuating Cylinder - Installation

NOTE

Compress metal seal ring(3) while installing seal ring holder(4) into fan duct.

n. Install plate(2), seal ring holder(4) with metal seal ring(3), retainer(5), and actuator(9) with packing(6) onto supports(1).

o. Install lubricated nuts(8). Torque 62 to 72 pound-inches.

p. Remove protective closures from PFSB tubes that connect to cylinder. Put a light coat of PWA 550 antigalling compound on threads of tube coupling nuts.

q. Remove protective closures from compressor bleed cylinder fuel drain tube. Lubricate threads of tube coupling nut using MIL-L-8937 dry film lubricant.

r. Connect compressor bleed cylinder PFSBC tube to upper of two in-line ports at top of cylinder. Torque tube coupling nut 65 to 75 pound-inches.

s. Connect compressor bleed cylinder PFSBO tube to lower of two in-line ports at top of cylinder. Torque tube coupling nut 65 to 75 pound-inches.

t. Connect compressor bleed cylinder fuel drain tube to lower port of cylinder. Torque tube coupling nut 65 to 75 pound-inches.

9. COMPRESSOR BLEED LINEAR ACTUATING CYLINDER - STORAGE AND SHIPMENT.
(See figure 2 and Figure 7.)

a. Remove attaching parts from cylinder. (See figure 2.)

b. Fill fuel ports with MIL-L-6081, Grade 1010 oil. Drain off excess.

c. Install shipping plugs. (See figure 7.)

d. Pack cylinder in a moisture and vapor proof container or wrapping. Seal container or wrapping with moisture proof tape.

e. If cylinder will be shipped, pack it in a shipping container. Use original shipping container, if possible. Cushion cylinder with shock absorbing packing material.

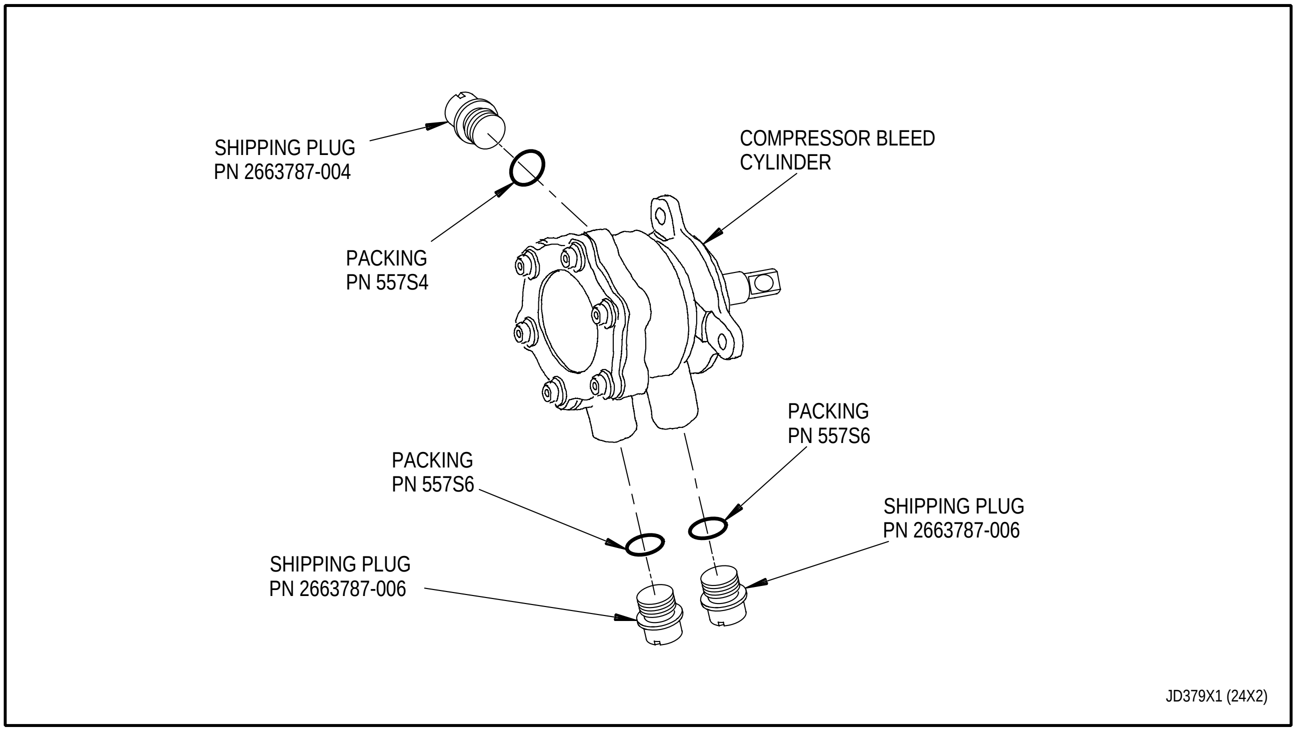


Figure 7. Compressor Bleed Linear Actuating Cylinder - Storage and Shipment

WORK PACKAGE

TECHNICAL PROCEDURES

VALVE - ANTI-ICING, ENGINE INLET

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 20

REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information	T.O. 2J-F100-53-1
General Procedures	WP 021 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
ALCOHOL, DENATURED OR	O-E-760, TYPE III
BRUSH, BRISTLE	-
CLOTH, LINT-FREE	-
COMPOUND, ANTIGALLING (PWA 550)	H-T-650 OR LUBRI-BOND HT
COMPOUND, ANTISEIZE (PWA 36053-3)	LOCKTITE NICKEL ANTI-SEIZE 771
FLUID, LEAK CHECK COMPOUND	MIL-L-25567, TYPE I
LOCKWIRE (0.032 INCH DIAMETER)	MS9226-04
SOLVENT, PETROLEUM	P-D-680, TYPE II
TRICHLOROETHANE INHIBITOR-1,1,1	O-T-620

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
GASKET	4075296	2
INSULATOR ASSEMBLY, METALLIC	325117	1
SEAL, METALLIC	226590	2

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures on the engine inlet anti-icing valve:

- Removal
- Cleaning
- Inspection
- Repair
- Installation

2. Deleted.

3. ENGINE INLET ANTI-ICING VALVE - REMOVAL.

(See Figure 2.)

a. Disconnect electrical cable connectors P149 and P150 from valve. Place protective closures on electrical connectors.

b. Loosen nuts securing clevis(12).

c. Loosen bolts(3) securing clamp(2).

d. Remove nuts(1) and bolts(7 and 10) securing valve(6).

e. Remove anti-icing valve(6) from between flanges of anti-icing manifolds(4 and 8).

f. Remove gaskets(5) from front and rear flanges of anti-icing valve(6) and discard.

g. Place protective closures over front and rear manifolds(4 and 8).

Figure 1. Deleted.

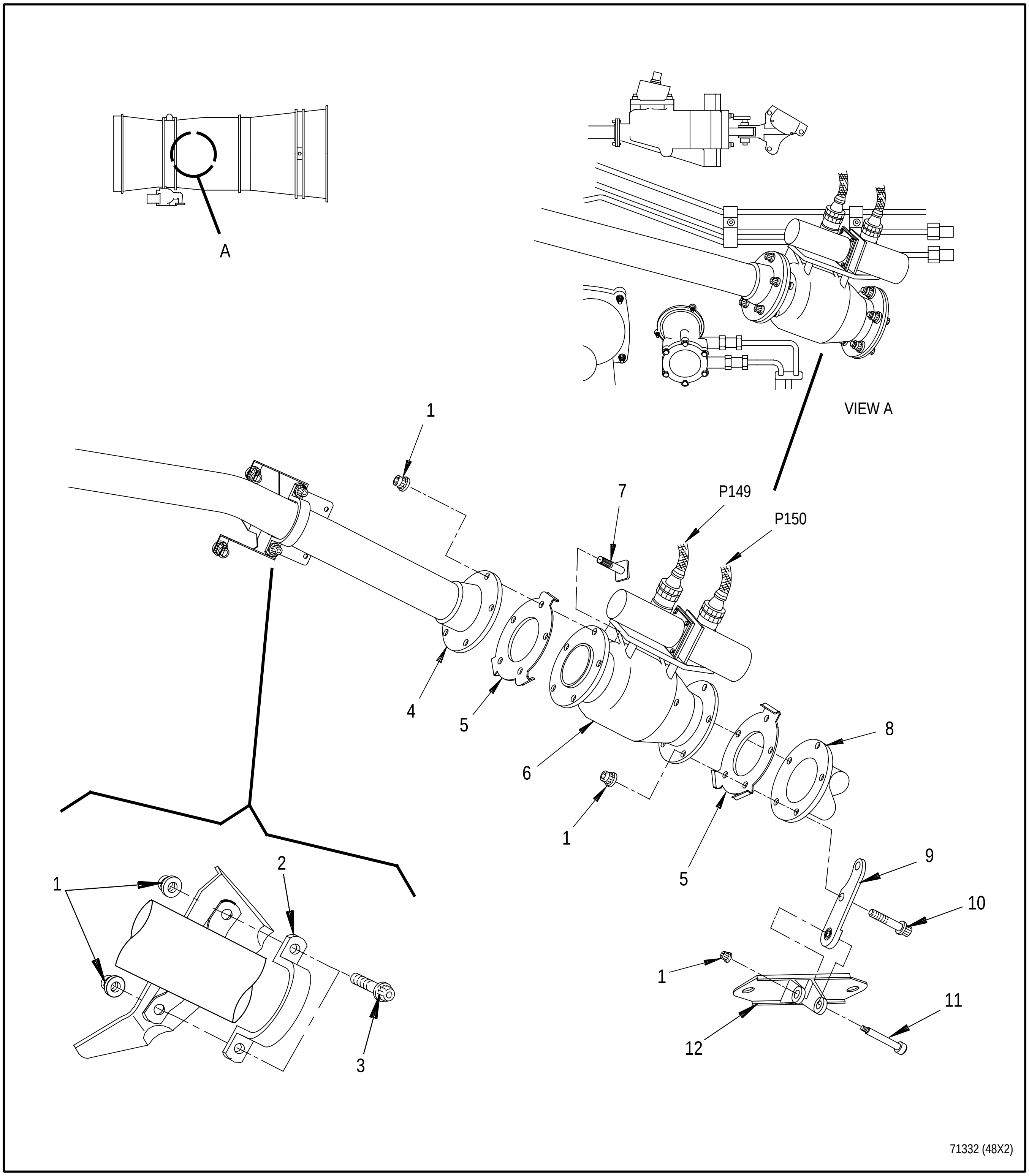


Figure 2. Engine Inlet Anti-icing Valve - Removal

Legend for Figure 2

1.	Nut	7.	Slab bolt
2.	Clamp	8.	Rear manifold
3.	Bolt	9.	Link
4.	Front manifold	10.	Bolt
5.	Gasket	11.	Bolt
6.	Anti-icing valve	12.	Clevis

4. ENGINE INLET ANTI-ICING VALVE - CLEANING.

a. Using a clean cloth moistened with P-D-680, petroleum solvent, wipe exterior of engine inlet anti-icing valve.

b. Wipe anti-icing valve dry with clean, dry lint-free cloth.

c. Remove protective closures from electrical connectors P149 and P150 that connect to anti-icing valve. Clean connector pins, sockets, and cable insulation with O-E-760, Type III denatured alcohol or trichloroethane inhibitor-1,1,1 O-T-620.

d. Let electrical connectors air dry or dry with clean compressed air at less than 30 psig. Replace protective closure on electrical connector.

5. ENGINE INLET ANTI-ICING VALVE - INSPECTION.

(See Figure 3.)

a. Inspect engine inlet anti-icing valve. See figure 3.

b. Inspect electrical connectors. Refer to T.O. 2J-F100-53-1, WP 021 00.

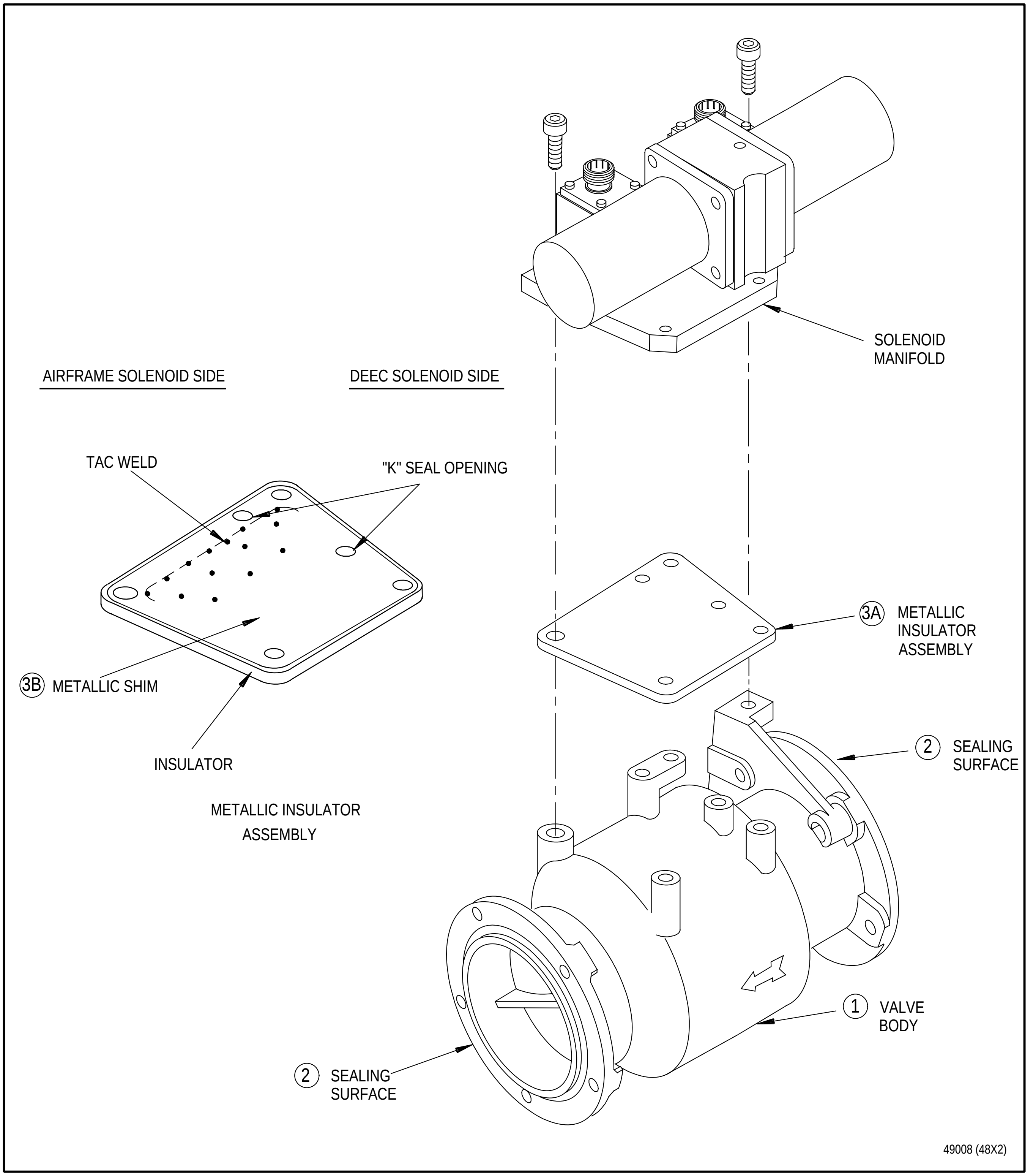


Figure 3. Engine Inlet Anti-icing Valve - Inspection

Legend to figure 3

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Valve body -			
Dented, cracked	Not serviceable	Not reparable	Replace anti-icing valve.
2. Sealing surface -			
Bent, cracked	Not serviceable	Not reparable	Replace anti-icing valve.
3. Deleted			
3A. Metallic insulator assembly -			
Missing pieces	Missing material not allowed in "K" seal area. See figure 3.	Not reparable	Replace metallic insulator assembly per paragraph 5B.
3B. Metallic shim -			
Shim separation	Separation within 0.005 of "K" seal holes not allowed.	Not reparable	Replace metallic insulator assembly per paragraph 5B.
Tack weld	No broken tack welds allowed.	Not reparable	Replace metallic insulator assembly per paragraph 5B.
4. Deleted			

5A. Deleted.

Figure 3A. Deleted.

Pages 6E through 6H deleted.

5B. ENGINE INLET ANTI-ICING VALVE - REPAIR.
(See Figures 3B and 3C.)

a. Disassemble anti-icing valve with metallic insulator as follows:

(1) Using two workbolts long enough to go through valve inlet cover plate(3, figure 3C), gasket(2) and valve inlet but not into bracket(4), install anti-ice valve on local manufacture holding fixture(19), solenoid manifold(9) on top.

(2) Using five work bolts, secure valve outlet cover plate(3) and gasket(2) to valve.

NOTE

Valve axis should be parallel with work bench and with solenoid connectors facing up during maintenance.

(3) Remove lockwire from solenoid manifold screws(10, 11, 12, and 14).

(4) Remove screw(12), nut(17), and washer(13) from rear of manifold assembly(9), retain hardware for assembly.

(5) Remove screws(11) and washers(16) in two places from manifold assembly(9), retain hardware for assembly.

(6) Remove screw(14) from manifold assembly(9), retain hardware for assembly.

(7) Remove manifold assembly(9) and bracket(4) from valve body(1).

(8) Remove two small metallic crush seals(8) and discard.

(9) Remove metallic insulator(6) and discard.

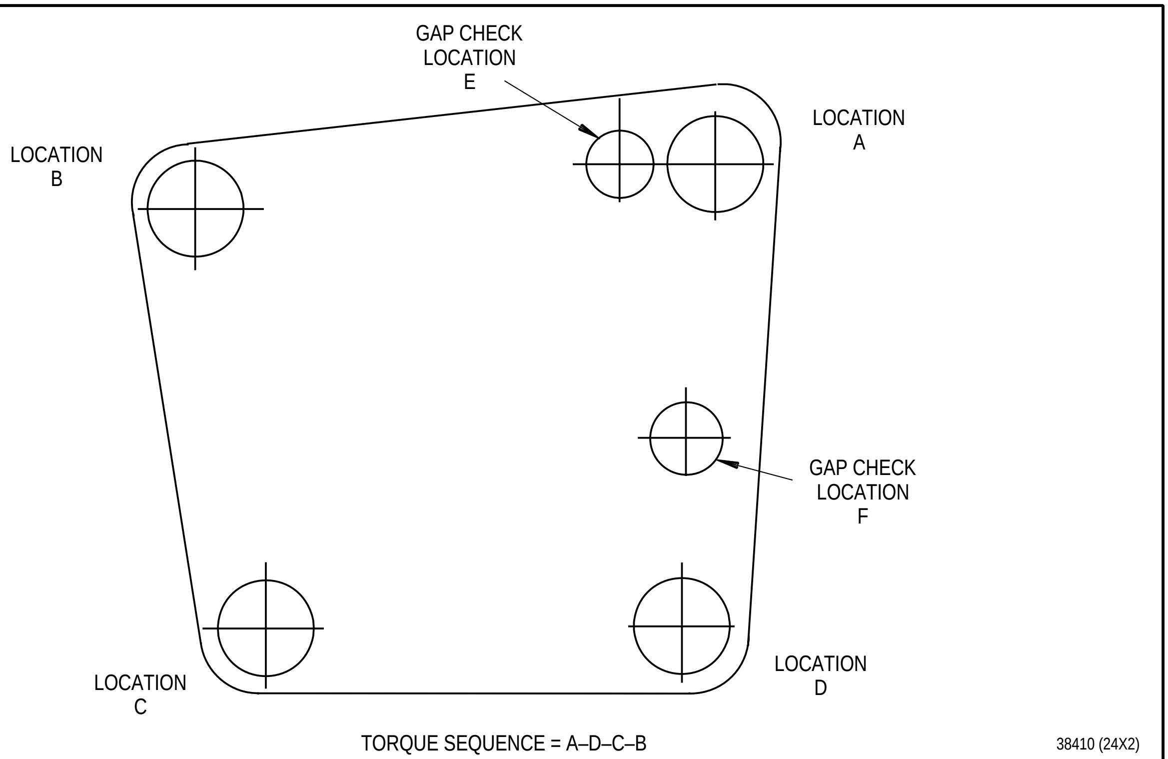


Figure 3B. Engine Inlet Anti-icing Valve Repair - Torque and Leak Check

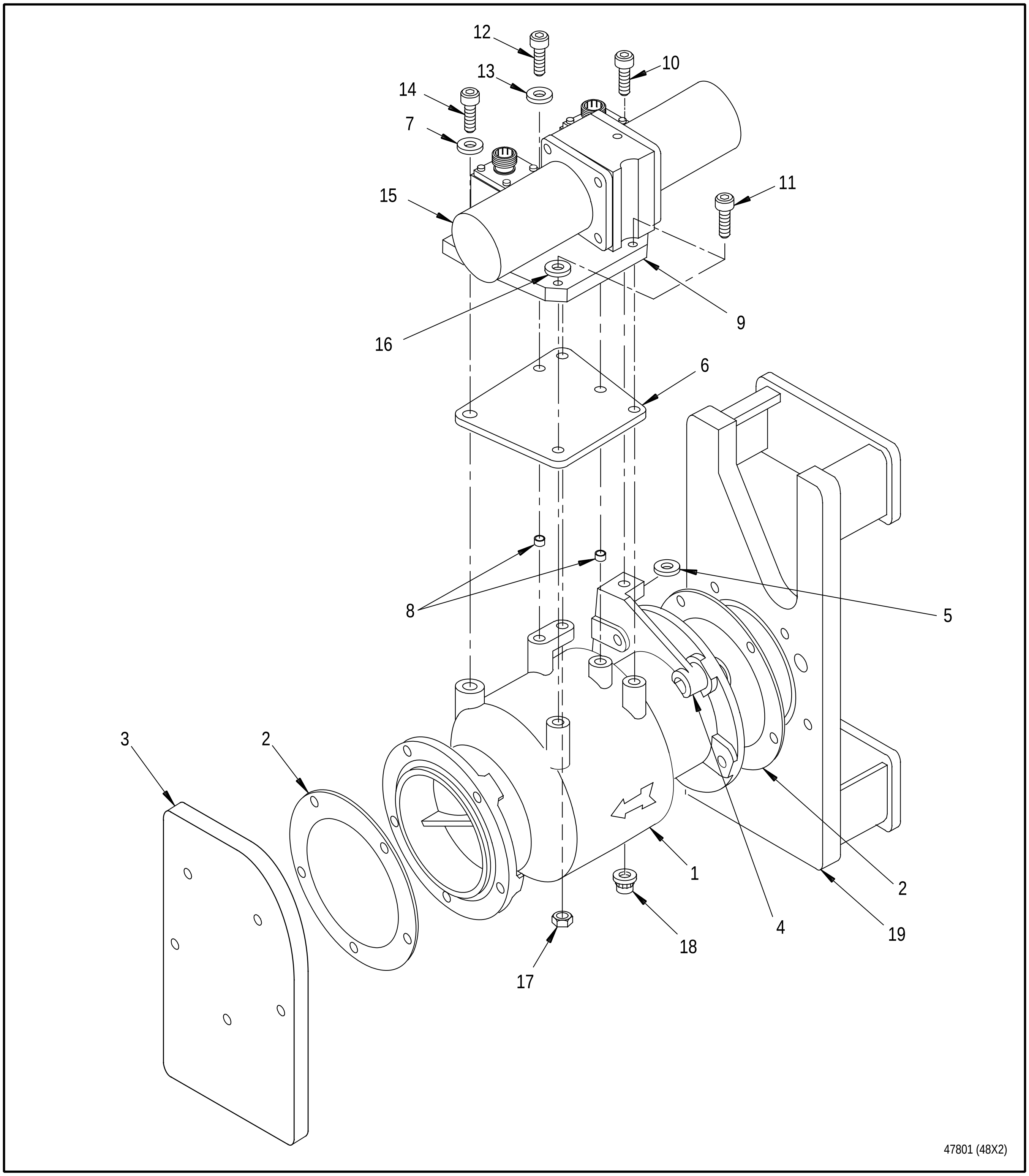


Figure 3C. Engine Inlet Anti-icing Valve - Repair

Legend to figure 3C

1.	Valve body	11.	Screw
2.	Gasket	12.	Screw
3.	Coverplate	13.	Washer
4.	Bracket	14.	Screw
5.	Washer	15.	Solenoid
6.	Metallic insulator	16.	Washer
7.	Washer	17.	Plain nut
8.	Metallic crush seal	18.	Lock nut
9.	Manifold assembly	19.	Fixture
10.	Screw		

b. Assemble anti-icing valve with metallic insulator assembly as follows:

(1) Install two metallic crush seals(8, figure 3C) into metallic insulator(6).

(2) Install metallic insulator(6) onto valve body(1) ensure screw holes are properly aligned.

(3) Place manifold assemby(9) on top of metallic insulator(6) stackup.

(4) Lubricate screw(12) threads with PWA 550 or equivalent and install screw(12) and washer(13) into manifold assembly(9) and valve body(1) and install nut(17).

(5) Lubricate screws(11) threads with PWA 550 antigalling compound or equivalent and install screw(11) and washer(16) into manifold assembly(9) and valve body(1).

NOTE

For ease of assembly hold insulator against manifold assembly and handtighten bolt.

(6) Lubricate screw(14) threads with PWA 550 or equivalent and install screw(14)and washer(7) into manifold assembly(9) and valve body(1).

(7) Torque all screws per torquing sequence A-D-C-B see figure 3B.

(8) Torque screw(12) 34 to 42 pound-inches above running torque.

(9) Torque screw(11) 34 to 42 pound-inches above running torque.

(10) Torque screw(14) 80 to 100 pound-inches above running torque.

(11) Using 0.005 inch feeler stock, measure any gap if present at metallic crush seal area, location E and F per figure 3B. If gap is larger than 0.005 inch increase final torque on all screws by 10%. After final torque, 0.005 inch gap is maximum allowable gap.

(12) Lockwire manifold screws and nut(17) using MS 9226-04 wire.

(13) Bench test valve repair per paragraph 5C.

5C. ENGINE INLET ANTI-ICING VALVE REPAIR - TORQUE AND LEAK CHECK
(See figure 3B and Figure 3D.)

c. Bench test anti-icing valve as follows:

(1) Using locally manufactured engine inlet anti-ice valve fixture and cover plate(PN TBD)(Figure 3D)ensure gaskets and all work bolts are installed and tightened prior to pressurizing valve.

(2) Attach shop air line to fitting on anti-ice valve inlet side of fixture.

(3) Pressurize valve 60 to 80 PSIG.

(4) Using leak check fluid or equivalent, brush fluid onto manifold valve body metallic crush seal points E and F, these are points where metallic crush seals contact valve body and manifold assembly is area where leakage will occur per figure 3B.

(5) Check for bubbles. Slow flow of bubbles are acceptable. If excessive leakage is noted in area of metallic crush seal points E and F, tag valve as unserviceable and return to supply. If leakage is acceptable tag as serviceable.

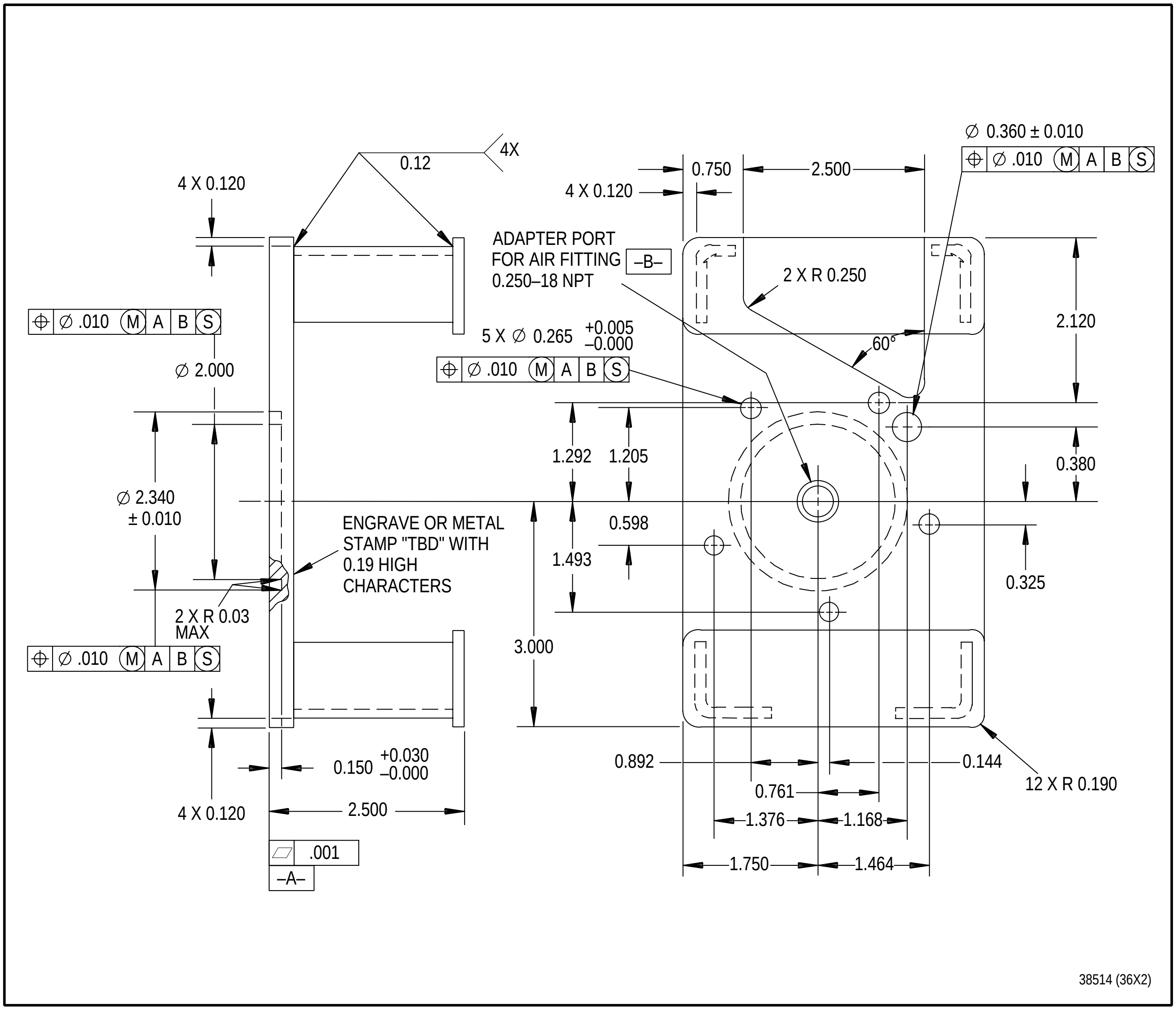


Figure 3D. Engine Inlet Anti-icing Valve Repair Fixture - Local Manufacture (Sheet 1 of 2)

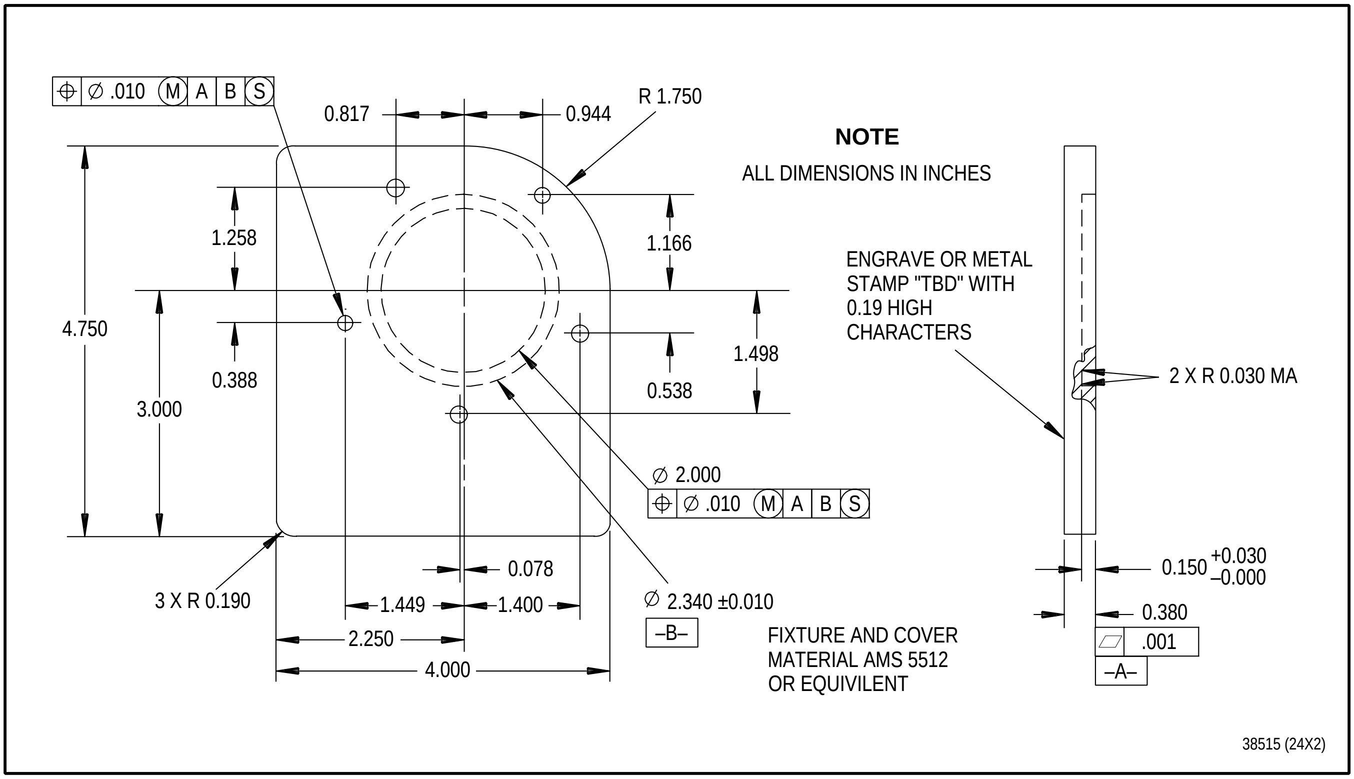


Figure 3D. Engine Inlet Anti-icing Valve Repair Fixture - Local Manufacture (Sheet 2 of 2)

6. ENGINE INLET ANTI-ICING VALVE - INSTALLATION.
(See Figure 4.)

a. Remove protective closures from manifolds (4 and 8).

b. Lubricate bolt(11) with MIL-L-7808 oil.

c. Connect link(9) to clevis(12) and secure with bolt(11) and nut(1).

d. Torque nut(1) 23 to 26 pound-ninches.

e. Lubricate bolts(7 and 10) with PWA 36545 antigalling compound.

f. Install gaskets(5) on flanges of anti-icing valve(6) tabs facing toward valve. Ensure tabs of gaskets do not contact front fan case.

g. Position anti-icing valve(6) between flanges of anti-icing manifolds(4 and 8).

NOTE

Bolt installation into anti-icing valve foward flange can be facilitated by slightly rotating anti-icing valve outward.

h. Loosely secure valve(6) at front end with slab bolts(7), heads rearward, and nuts(1). Install inboard bolt first in valve flange hole, rotate valve back until bolt slides through forward manifold rear flange bolt hole.

i. Loosely secure link(9) to rear of flange of manifold(8) with bolts(10), heads rearward, and nuts(1).

j. Continue to loosely secure valve(6) at rear end with bolts(7), heads rearward, and nuts(1).

k. Torque nuts(1) securing valve(6) 62 to 72 pound-inches.

l. Torque nuts securing clevis(12) 62 to 72 pound-inches.

m. Torque bolts(3) securing clamps(2) 23 to 26 pound-inches.

n. Remove protective closures from electrical connectors P149 and P150 and install as follows:

(1) Align keyways and handtighten connector.

(2) Ensure red line on receptacle is not visible when viewed at right angles.

(3) Tighten connector firmly with soft-jawed pliers.

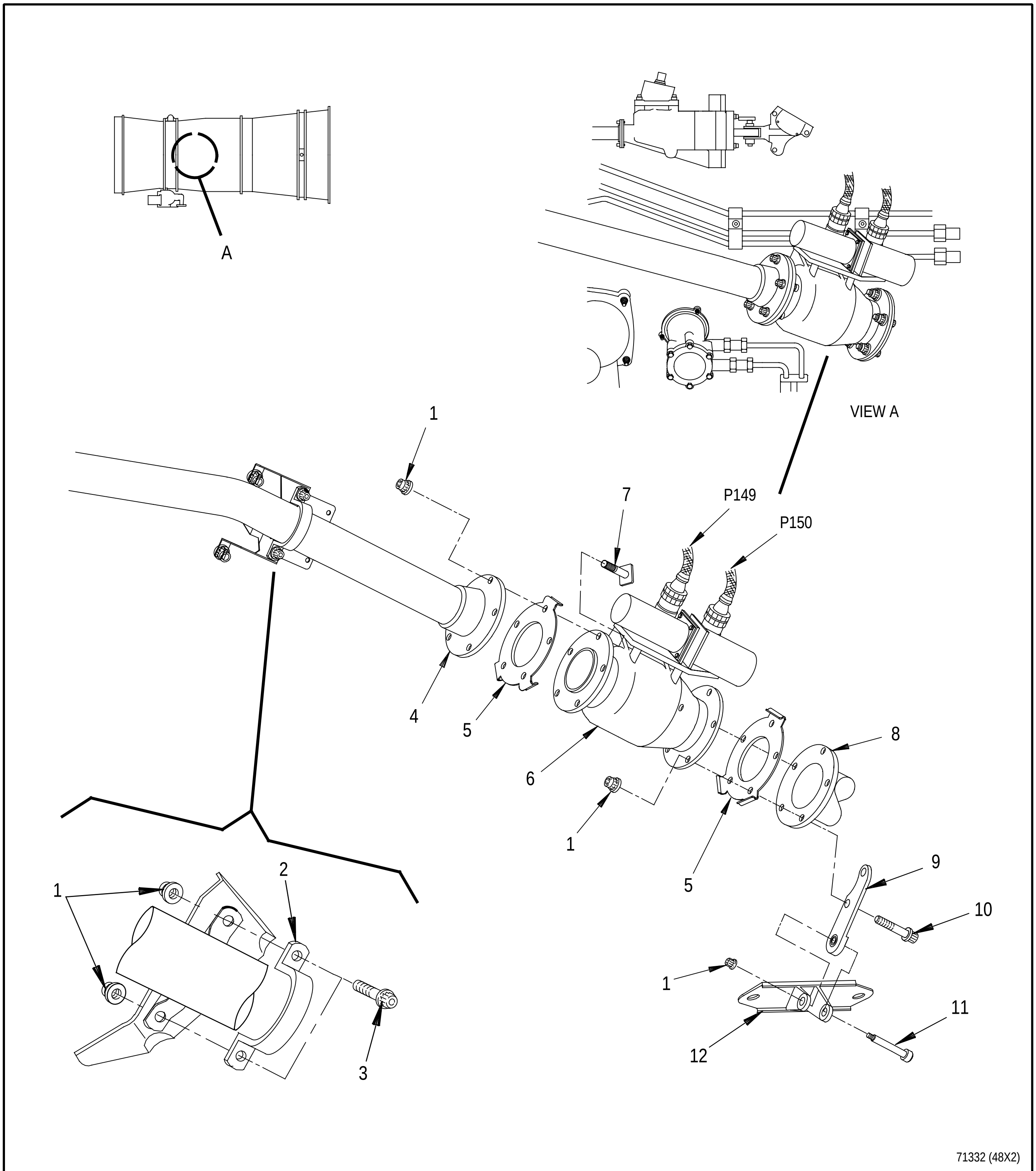


Figure 5. Figure 4. Engine Inlet Anti-icing Valve - Installation

Pages 11 and 12 Including Figure 5 are deleted.

WORK PACKAGE

TECHNICAL PROCEDURES

NOZZLE - CONVERGENT, ACTUATION SYSTEM, INTEGRITY CHECK

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 18

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 3	26	6 - 7	26	8 - 17	0
4 - 5	0			18 Blank	0

REFERENCE MATERIAL REQUIRED

Title	Number
Engine Accessories and Rigging Procedures	T.O. 2J-F100-53-4
Shafts - Flexible, Primary and Secondary Actuator, Convergent Nozzle	WP 042 00
Actuators - Ball Screw, Primary and Secondary,Convergent Nozzle	WP 043 00
Control - Exhaust Nozzle, Convergent	WP 044 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Compound, antigalling (PWA 36035)	Fel-Pro C-300
Lockwire (0.020 inch diameter)	MS9226-02

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Cotter pin	MS9245-28	5

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
3	Convergent Nozzle Actuation System Integrity Check	
	Torque adapter - Primary convergent nozzle ball screw actuator, turn & count	PWA 51757 or
	Adapter - Augmentor nozzle actuator drive	PWA 56639

ILLUSTRATED SUPPORT EQUIPMENT

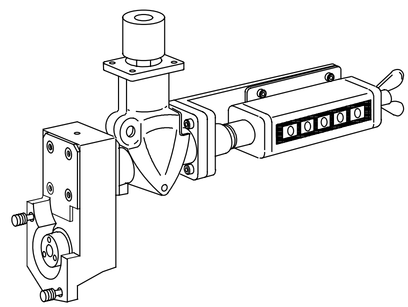


Figure T1. PWA 51757 Torque Adapter

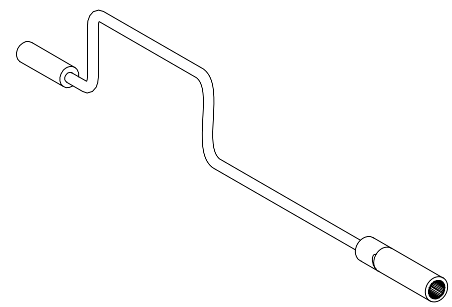


Figure T2. PWA 56639 Adapter

1. INTRODUCTION.

a. This work package contains instructions for checking the operational integrity of the convergent exhaust nozzle actuation system. This check is performed with augmentor duct and nozzle module installed on engine.

2. PRELIMINARY INSTRUCTIONS.

(See Figure 1.)

a. Remove convergent nozzle primary actuator flexible shafts as follows:

(1) Remove bolt and nut from loop clamp. (See figure 1.)

(2) Hold hex on bushing and loosen jamnuts and coupling nuts. Slide nuts back onto tube assembly.

(3) Slide couplings away from convergent exhaust nozzle control. Remove drive cable from control.

(4) Remove bolts from tube adapters. Slide adapters back over tube.

(5) Remove T-shaped cotter pins. Remove flexible shafts from convergent nozzle primary ball screw actuator.

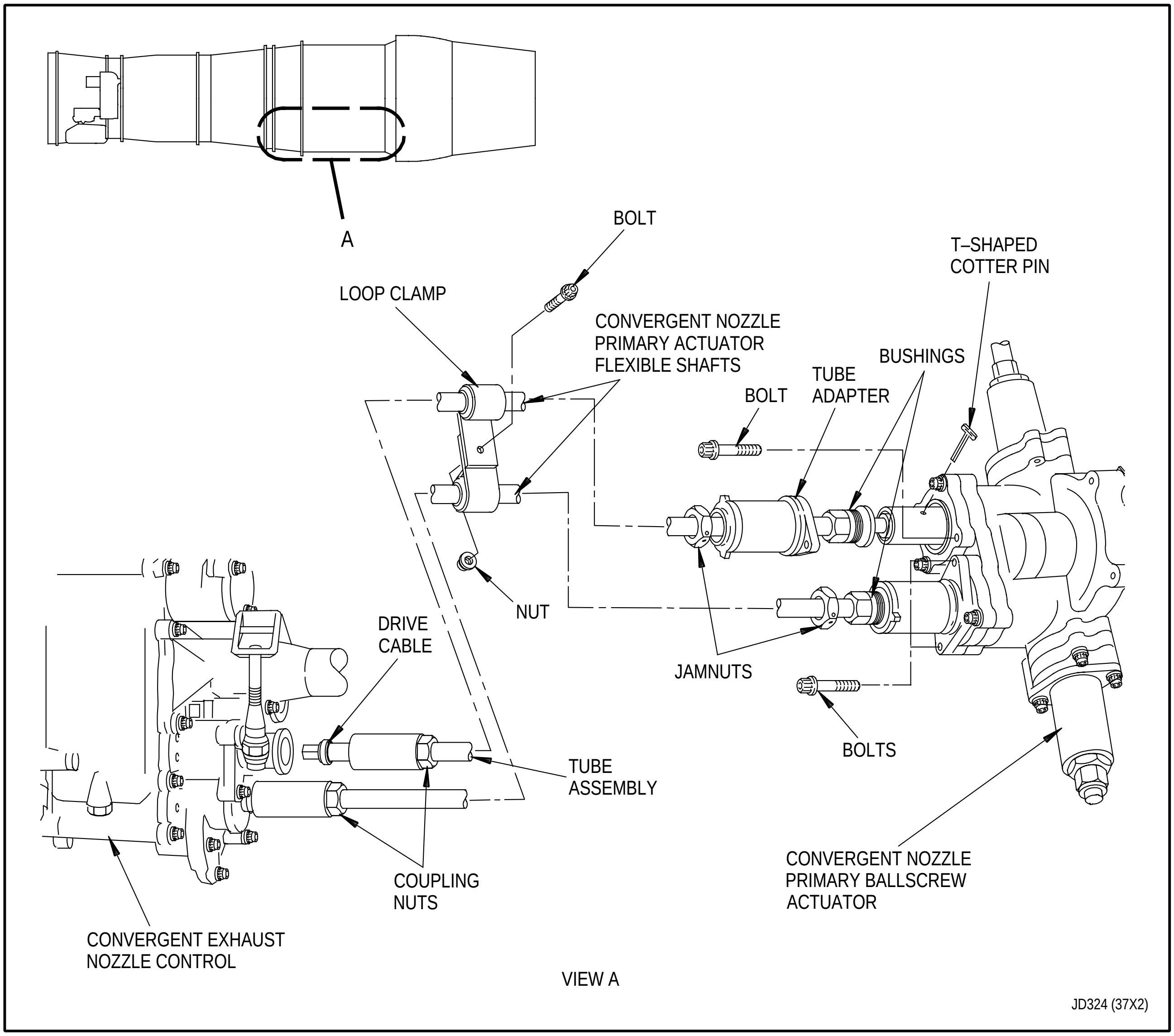


Figure 1. Convergent Nozzle Primary Actuator Flexible Shafts - Removal

3. CONVERGENT NOZZLE ACTUATION SYSTEM - INTEGRITY CHECK.

(See Figures 2 through 8.)

NOTE

PWA 56639 adapter may be substituted for PWA 51757 torque adapter.

a. Install PWA 51757 torque adapter on left-hand feedback drive input shaft of convergent nozzle primary ball screw actuator. (See figure 2.) Install bolt details and torque.

b. If required, install manual crank (ratchet, speed handle, air gun, or equivalent) into square drive adapter on PWA 51757 torque adapter.

CAUTION

Ball screw actuators can be damaged if excessive torque is applied after contact is made with either retracted or extended internal stops.

c. Turn square drive adapter clockwise until augmentor nozzle assembly is fully open (actuators against retracted internal stops).

NOTE

PWA 56639 adapter may be substituted for PWA 51757 torque adapter, but only if a second person assists in counting and recording number of full travel turns from hard stop to hard stop.

d. Turn wing nut on wrench to set wrench counter to zero.

e. Perform following check:

(1) Turn square drive adapter counterclockwise to fully close nozzle against ball screw actuator stops.

(2) Record number on wrench counter. Set counter to zero with wing nut.

(3) Turn square drive adapter clockwise to fully open nozzle against actuator hard stops. Record number on counter.

(4) Turn square drive adapter counterclockwise to fully close nozzle against actuator hard stops. Remove wrench.

(5) If operation of nozzle assembly was smooth from stop to stop and number recorded on counter in step e.(2) and (3) was 341 ±1; proceed to step g.

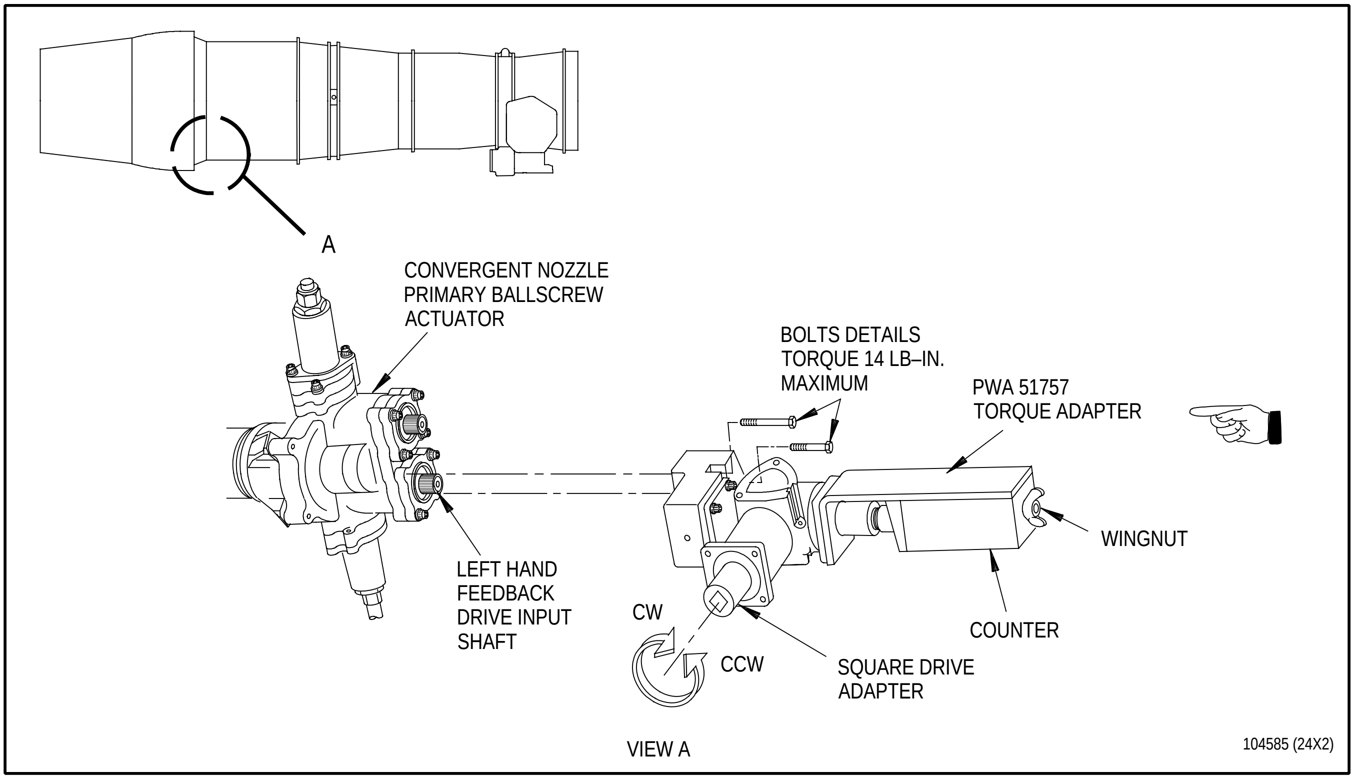


Figure 2. Convergent Nozzle Actuation System - Integrity Check

f. If operation of nozzle assembly was not within limits of step e.(5), perform the following:

CAUTION

Do not remove or install more than one actuator at a time.

(1) Remove primary actuator or one secondary actuator and adjacent convergent nozzle secondary actuator flexible shafts. Refer to WP 043 00.

(2) Inspect removed actuator. Refer to WP 043 00.

(3) Install actuator, or sized replacement. Refer to WP 043 00.

(4) Repeat steps f.(1), (2), and (3) for each remaining actuator.

(5) Inspect secondary actuator flexible shafts. (See figures 4 and 5.)

(6) Proceed to step i.

NOTE

Following steps g. through i. apply if step f. was not done.

g. Remove five convergent nozzle secondary actuator flexible shafts as follows:

(1) Hold hex on bushing and loosen jamnut on each end of shaft. Slide jamnut back over tube assembly. (See figure 3.)

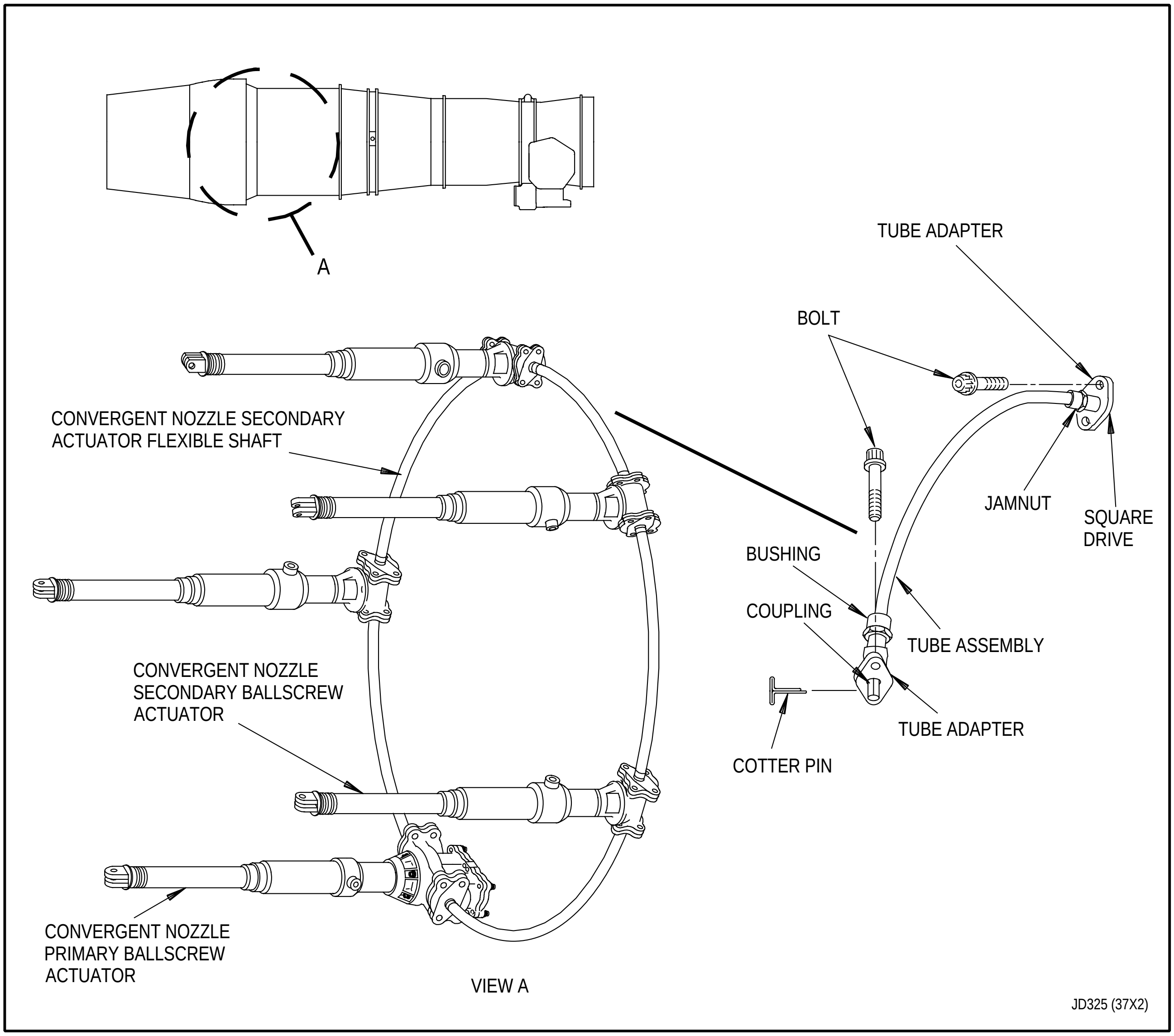


Figure 3. Convergent Nozzle Secondary Actuator Flexible Shafts - Removal

NOTE

Do not remove bolts that have lockwire with lead seal.

(2) Remove bolts from tube adapters.

(3) Slide adapters back over tube assembly. Remove cotter pin.

(4) Remove flexible shaft from engine.

h. Inspect primary and secondary flexible shafts. (See figures 4, 5, and 6.)

(1) If both primary drive cables are broken and replaced and found to be broken again, within 50 hours, convergent exhaust nozzle control shall be replaced.

i. Inspect primary and secondary flexible shafts for absence of internal lubrication. If grease is not visible at each internal end of shaft, disassemble, clean, inspect, and assemble shaft. Refer to WP 042 00.

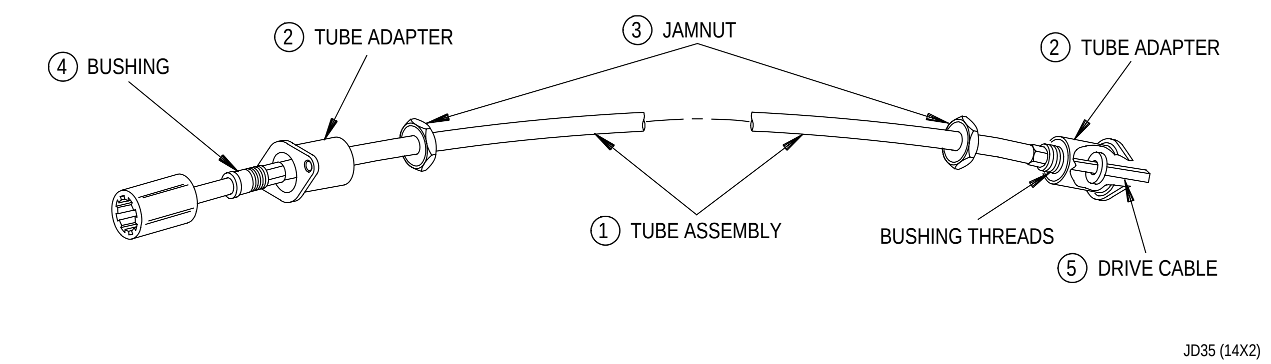


Figure 4. Convergent Nozzle Secondary Actuator Flexible Shaft - Inspection

Legend for figure 4

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Tube assembly -			
Deformed, bent, dented, cracked	Serviceable if drive cable does not contact inner wall of tube assembly.	Not reparable	Replace flexible shaft.
2. Tube adapter -			
Cracked, deformed, damaged bolt holes	Not serviceable	Not reparable	Replace flexible shaft.
3. Jamnut -			
Cracked	Not serviceable	Not reparable	Replace flexible shaft.
Threads stripped or damaged	Not serviceable	Not reparable	Replace flexible shaft.
4. Bushing -			
Threads stripped or damaged	Not serviceable	Not reparable	Replace flexible shaft.
5. Drive cable -			
Broken	Not serviceable	Not reparable	Replace flexible shaft.

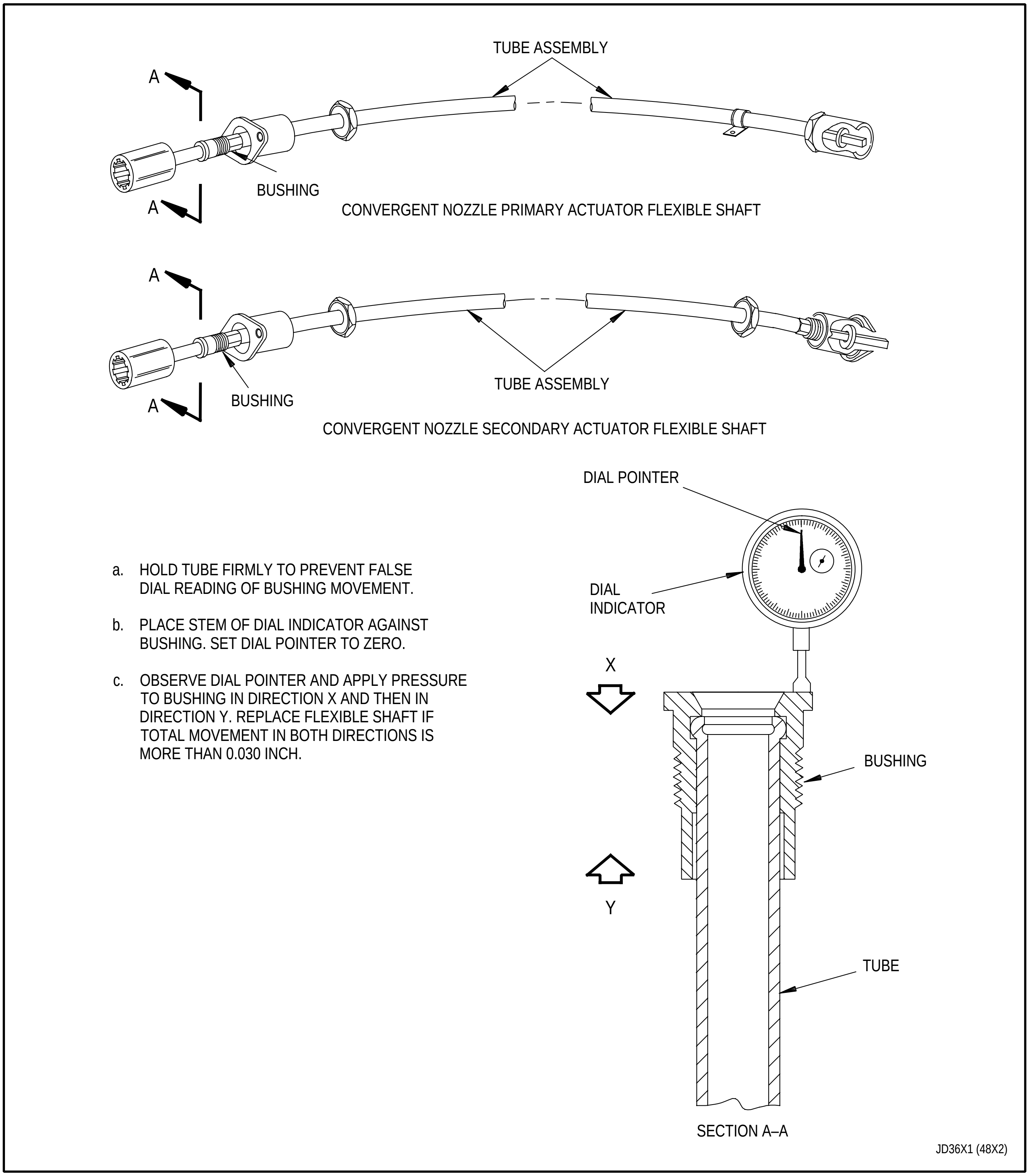
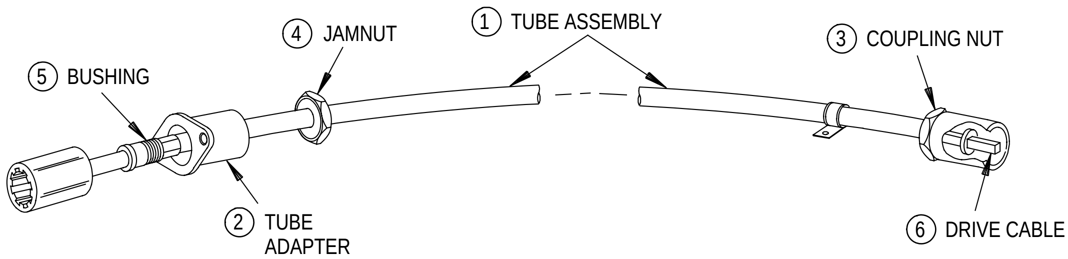


Figure 5. Convergent Nozzle Primary and Secondary Actuator Flexible Shaft - Bushing End Play Inspection



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Tube assembly -			
Deformed, bent, dented, cracked	Serviceable if drive cable does not contact inner wall of tube assembly.	Not reparable	Replace flexible shaft.
2. Tube adapter -			
Cracked, deformed, damaged bolt holes	Not serviceable	Not reparable	Replace flexible shaft.
3. Coupling nut -			
Cracked, deformed, damaged threads	Not serviceable	Not reparable	Replace flexible shaft.

Figure 6. Convergent Nozzle Primary Actuator Flexible Shaft - Inspection

Legend for figure 6 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
4. Jamnut -			
Cracked	Not serviceable	Not reparable	Replace flexible shaft.
Threads stripped or damaged	Not serviceable	Not reparable	Replace flexible shaft.
5. Bushing -			
Threads stripped or damaged	Not serviceable	Not reparable	Replace flexible shaft.
6. Drive cable -			
One cable broken	Not serviceable	Not reparable	Replace flexible shaft.
Both cables broken	Not serviceable	Not reparable	Replace flexible shafts and nozzle actuators.
Both cables broken (Second occurrence within 50 hours)	Not serviceable	Not reparable	Replace flexible shafts, nozzle actuators and, convergent exhaust nozzle control. Refer to WP 042 00 and WP 044 00.

j. Check primary and secondary ball screw actuators as follows:

(1) Place square drive of torque wrench in square drive of each actuator. (See figure 7.)

CAUTION

Actuator can be damaged if excessive torque is applied.

(2) Apply 25 pound-inches maximum torque in extend direction.

(3) A certain amount of windup, 50 to 90 degrees, is normal when torque is applied. Torque wrench should return to initial angular location when torque is removed. If not, replace actuator. Refer to WP 043 00.

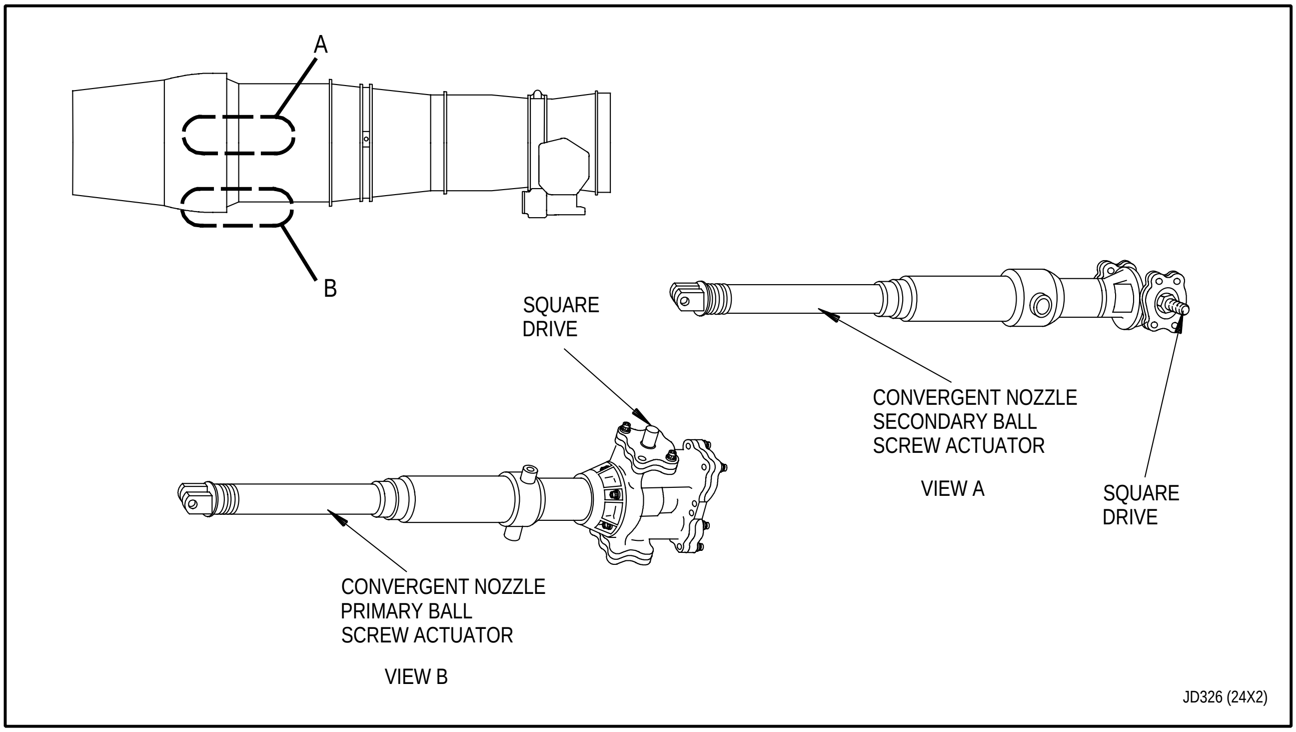


Figure 7. Convergent Nozzle Primary and Secondary Ball Screw Actuators - Inspection

k. Install secondary actuator flexible shafts as follows:

(1) Slide tube adapter back over tube assembly. (See figure 8.)

(2) Insert inner square drive of flexible shaft into square drive of actuator. Do not rotate actuator square drive.

(3) Align coupling splines on other end of flexible shaft with splines of adjacent actuator. Do not rotate actuator splines.

(4) Slide coupling splines over actuator splines and align cotter pin hole in splines and coupling.

(5) Install T-shaped cotter pin and bend ends around coupling.

(6) Position tube adapters against actuators.

(7) Apply Fel-Pro C-300 lubricant to threads of bolts. Remove excess. Install, torque and lockwire bolts. (See figure 8.)

(8) Tighten and torque jamnuts against tube adapters. Lockwire. (See figure 8.)

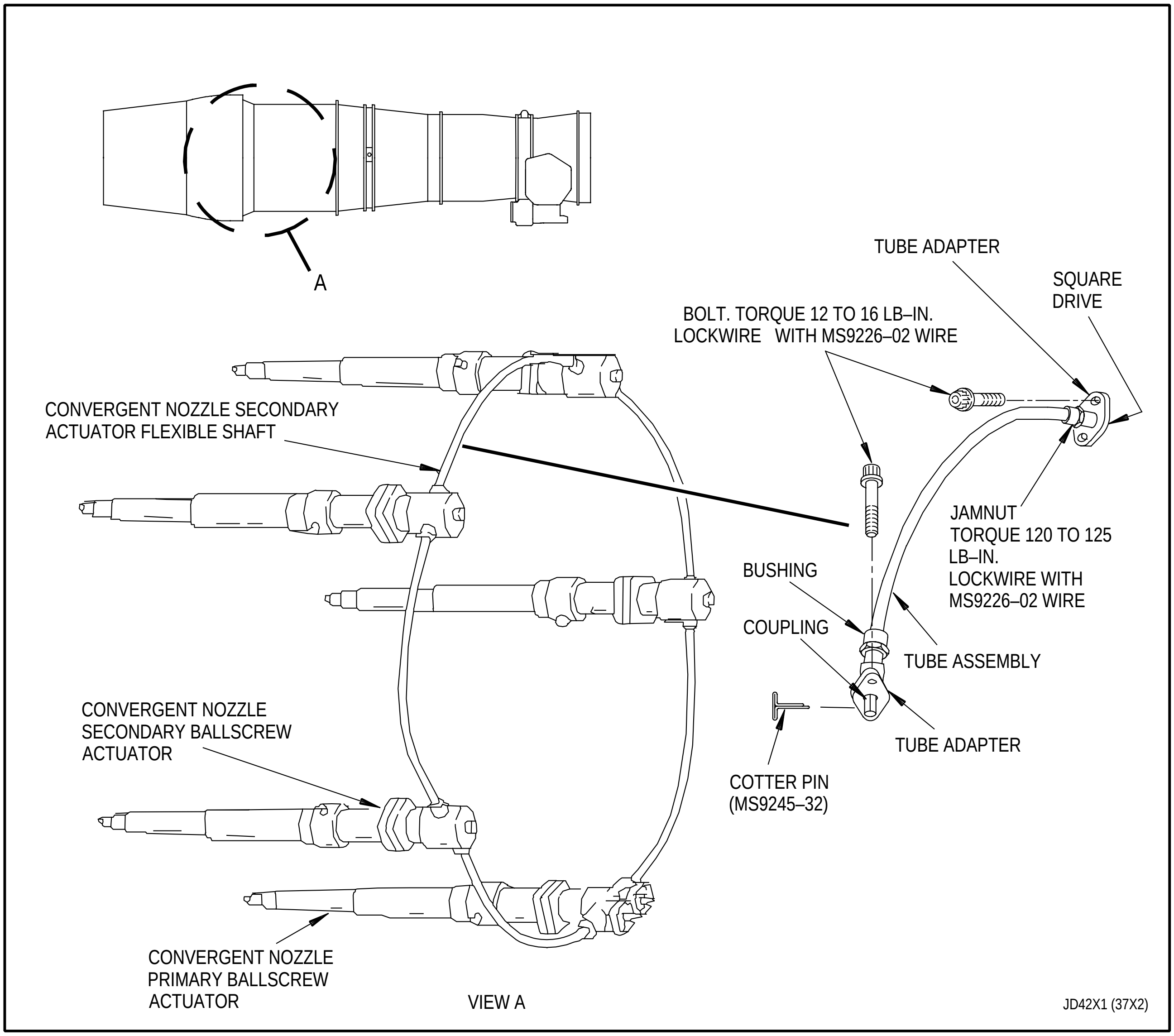


Figure 8. Convergent Nozzle Secondary Actuator Flexible Shafts - Installation

4. FOLLOW-ON MAINTENANCE.

a. Install convergent nozzle primary ball screw actuator flexible shafts and rig convergent exhaust nozzle control system. Refer to WP 103 00.

WORK PACKAGE

TECHNICAL PROCEDURES

DETECTOR - AUGMENTOR LIGHT-OFF

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 26

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2	21	6B	21	14B Blank Added	21
3	13	7 - 13	0	15	0
4 - 5	0	14	21	16 - 17	18
6	2	14A Added	21	18	3
6A Added	2			19 - 22	0

REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information -------------	T.O. 2J-F100-53-1
General Procedures --------------------------	WP 021 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Adhesive/Sealant, silicone rubber (PWA 617)	DC 3145
Alcohol, denatured	O-E-760, Type III
or	
Trichloroethane	O-T-620
Alcohol,isopropyl	TT-I-735 Grade A or PMC 9016
Cloth, fine, emery	-
Cloth, dry, lint-free	-
Compound, antigalling (PWA 550)	Hi-T-650 or Lubri-Bond HT
Compound, retaining	Loctite 272
Cotton swab	-
Methyl ethyl ketone	ASTM D740 or PMC 9076
Primer	DC 1204
Rubber padding, silicone	4861010-01
Solvent, petroleum	P-D-680, Type II or Type III
Tape, teflon adhesive	-
Tube, teflon 22 (sleeve)	6761001-01
Tubing, teflon	6761001-05
Wire, nickel	2551005-01

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Gasket, connector	910092117	1
Gasket, cover	910093102	1

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
8	Augmentor Light-Off Detector - Sensor Source Assembly Replacement	
	Spanner Wrench -----------------------	PWA 57744
10	Module Fault Isolation Test	
	Ohmmeter, PSM-6 or equivalent -------------	NSN 6625-00-643-1686

ILLUSTRATED SUPPORT EQUIPMENT

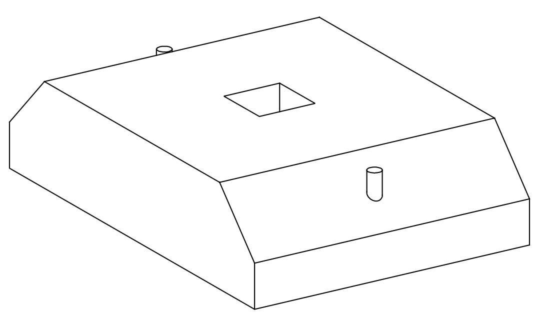


Figure T1. PWA 57744 Spanner Wrench

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures on the augmentor light-off detector:

- Removal
- Cleaning
- Inspection
- Mount gasket - Replacement
- T1 module assembly - Replacement
- T2 module assembly - Replacement
- Connector assembly - Replacement
- Sensor source assembly - Replacement
- Installation
- Module fault isolation test

2. AUGMENTOR LIGHT-OFF DETECTOR - REMOVAL.
(See Figure 1.)

a. Disconnect electrical connector P116 from augmentor light-off detector and cap electrical connector.

b. Remove nuts and washers from studs at end of detector and remove detector.

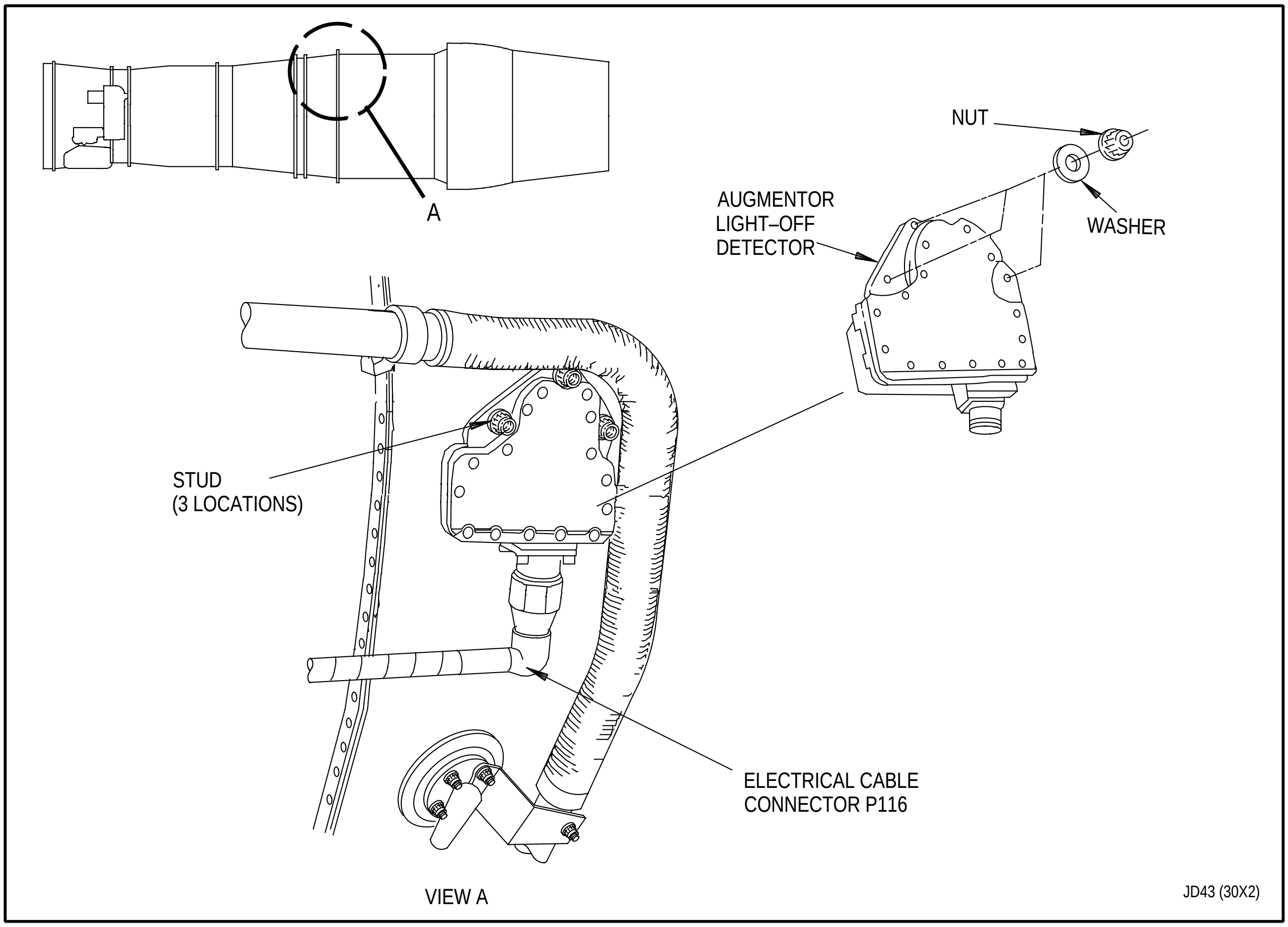


Figure 1. Augmentor Light-off Detector - Removal

3. AUGMENTOR LIGHT-OFF DETECTOR - CLEANING.

a. Using a clean cloth moistened with P-D-680, Type II petrolatum solvent, wipe exterior of detector.

WARNING

Some LOD mount gaskets are made of asbestos. Do not direct compressed air onto gasket to avoid blowing loose asbestos particles into the air. Wear protective clothing and equipment when cleaning these units.

b. Dry detector with a clean, dry, lint-free cloth.

c. Remove protective closure from electrical connector. Clean connector pins, socket, and cable insulation with O-E-760, Type III denatured alcohol or O-T-620 Trichloroethane. Dry connector using less than 30 psig clean air. Replace protective closure.

4. AUGMENTOR LIGHT-OFF DETECTOR - INSPECTION.

(See Figure 2.)

a. Remove protective closure from electrical connector. Inspect connector threads for damage. Inspect electrical connector. Refer to T.O. 2J-F100-53-1, WP 021 00.

WARNING

Some LOD mount gaskets are made of asbestos, which is hazardous if inhaled. Wear protective clothing and equipment when handling these units. Do not scrape or chafe asbestos gasket, which may release particles into the air.

b. Inspect gasket on LOD triangular mount pad for unbonding. Replace unbonded gasket per paragraph 4A. (See figure 2.)

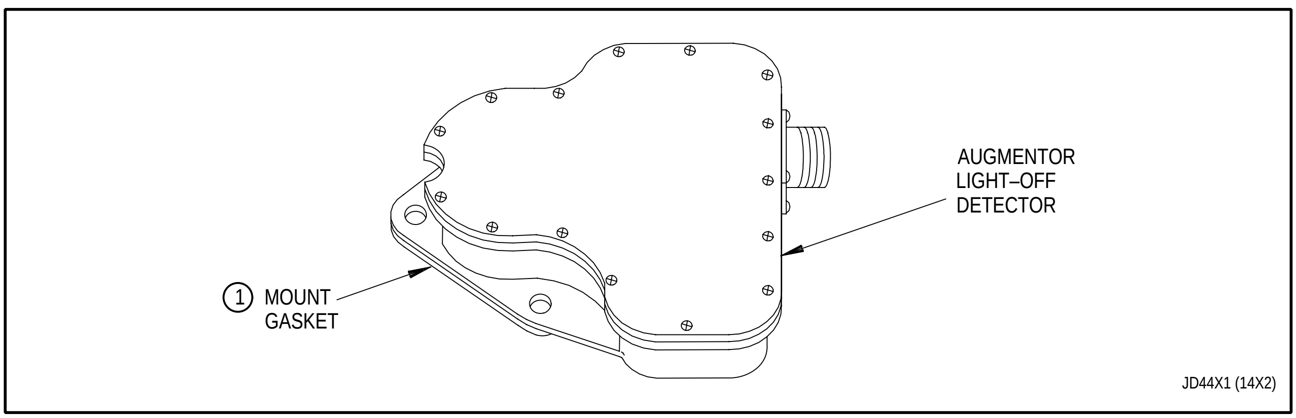


Figure 2. Augmentor Light-off Detector - Inspection

Legend for figure 2

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Mount Gaskket -			
Unbonded	Not serviceable	Not reparable	Rebond spacer.
Cracked	Allowed	Not reparable	None.
Missing material	Minor chipping allowed	Not reparable	Replace spacer.

4A. AUGMENTOR LIGHT-OFF DETECTOR - MOUNT GASKET REPLACEMENT.

WARNING

Some LOD mount gaskets are made of asbestos. Wear protective clothing and equipment when handling these units to prevent asbestos contamination and inhalation.

a. Replace LOD mount gasket as follows:

(1) Remove gasket material with a suitable flat scrapper.

(2) Remove adhesive using methyl ethyl ketone ASTM D740 or PMC 9076.

(3) Lightly buff LOD mating surface with fine emery cloth. Wipe off all residue with lint-free cloth mositened with isopropyl alcohol TT-I-735 Grade A or PMC 9016.

(4) Apply RTV primer 1204 to LOD and new gasket mating surfaces. Allow primer to cure at room temperature for 2 hours.

(5) Apply PWA 617 adhesive/ sealant to gasket mating surface 50 to 100 mils thick. Smooth adhesive to an even layer.

(6) Mate spacer and LOD surfaces, making sure mounting holes align.

(7) Secure gasket in place with three bolts, washers, and nuts. Torque 65 to 75 pound-inches.

(8) Using a dry lint-free cloth, remove excess sealant.

(9) Allow sealant to cure at room temperature for 72 hours.

(10) Remove bolts, nuts, and washers.

5. AUGMENTOR LIGHT-OFF DETECTOR - T1 MODULE ASSEMBLY REPLACEMENT.
(See Figure 3 and Table 1.)

a. Remove screws and washers from LOD cover.

b. Remove cover and discard gasket.

c. Unwrap silicon rubber padding. Note location of nickel wire wraps, teflon tubing, and tape.

d. Cut nickel wire wraps(2, figure 3) covered with teflon tubing and unwrap tape.

e. Slide teflon tube sleeves(1) back to expose T1 module assembly and sensor source assembly pin connections.

f. Use plastic pliers to disconnect two sensor source assembly pins(3) from T1 module assembly sockets.

g. Cut nickel wire wraps covered with teflon tubing(5).

h. Disconnect two connector assembly pins(4) from T1 module assembly sockets and three T1 module assembly pins(9) from T2 module assembly sockets.

i. Remove screws(6 and 7) and washers from housing. Remove T1 module assembly from LOD.

j. Ensure harness support bracket(8) is secured under screw(7).

k. Install T1 module assembly into LOD housing, and secure with screws(6 and 7) and washers. See figure 3 for proper positioning of T1 module assembly. Torque screws to 10 pound-inches, then to 16 pound-inches.

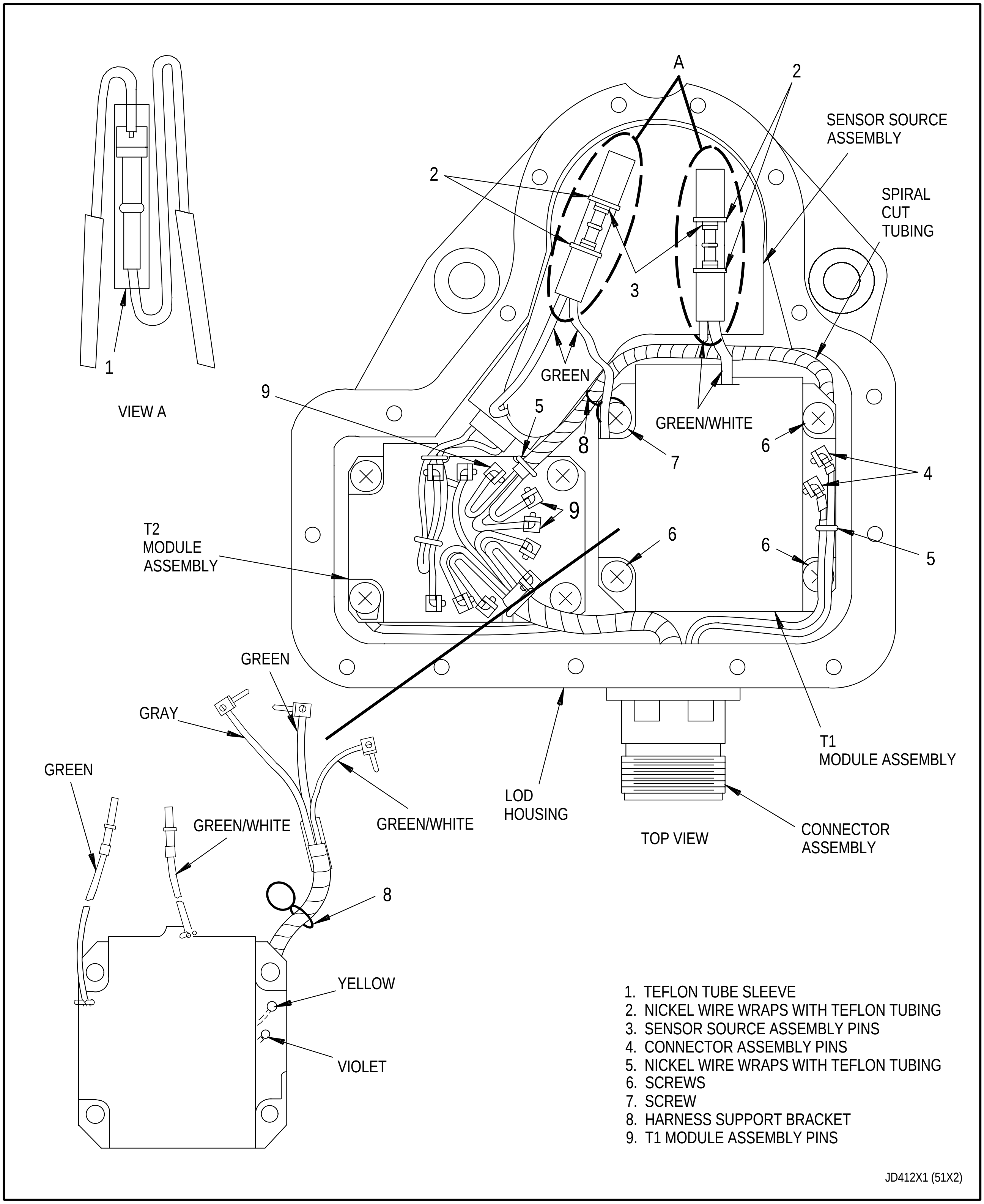


Figure 3. Augmentor Light-Off Detector - T1 Module Replacement

l. Connect T1 module assembly pins(9) to T2 module assembly sockets and connector assembly pins(4) to T1 module assembly sockets.

m. Connect sensor source assembly pins(3) to T1 module assembly sockets, connecting green/white wire to green/white wire and green wire to green wire.

n. Slide teflon tube sleeves(1) over connections.

o. Bend wires (stress-relieve) into position. (See figure 3, see View A.)

p. Wrap wires and ends of teflon tube sleeves with tape.

q. Secure tape with nickel wire(2) covered with teflon tubing, four places.

r. Cut two pieces of silicon rubber padding, 4 inches by 1.5 inches.

s. Wrap nickel wire wraps, teflon tube sleeves, and tape with silicon rubber padding, see View A.

t. Apply Loctite 272 to screw threads.

u. Position cover and PN 910093102 gasket on LOD housing and secure with screws and washers. Torque screws to 10 pound-inches, then to 16 pound-inches.

v. Perform LOD functional test. (See table 1.)

6. AUGMENTOR LIGHT-OFF DETECTOR - T2 MODULE ASSEMBLY REPLACEMENT.
(See Figure 4 and table 1.)

a. Remove screws and washers from LOD cover.

b. Remove cover and discard gasket.

c. Note location of nickel wire wraps, teflon tubing, and tape.

d. Cut nickel wire wraps(2, figure 4) covered with teflon tubing.

e. Use plastic pliers to disconnect ten pins(3) from T2 module assembly sockets.

f. Remove mounting screws(1 and 5), washers, and retaining ground lug(4) on T2 module assembly. Remove T2 module assembly from LOD.

NOTE

T2 module assembly bracket will not be flush with LOD housing base at installation.

g. Install T2 module assembly into LOD housing, and secure with three mounting screws(1) and washers.

h. Connect ground lug(4) to T2 module assembly and install remaining mounting screw(5) and washer. Torque screws evenly to 10 pound-inches, then to 16 pound-inches.

i. Connect ten pins(3) to T2 module assembly sockets. (See figure 4.)

j. Bend wires (stress-relieve) into position. (See figure 4.)

CAUTION

Do not allow nickel wire to contact pins, or LOD will short.

k. Install nickel wire(2) covered with teflon tubing, three places.

l. Apply Loctite 272 to screw threads.

m. Position cover and PN 910093102 gasket on LOD and secure with screws and washers. Torque screws to 10 pound-inches, then to 16 pound-inches.

n. Perform LOD functional test. (See table 1.)

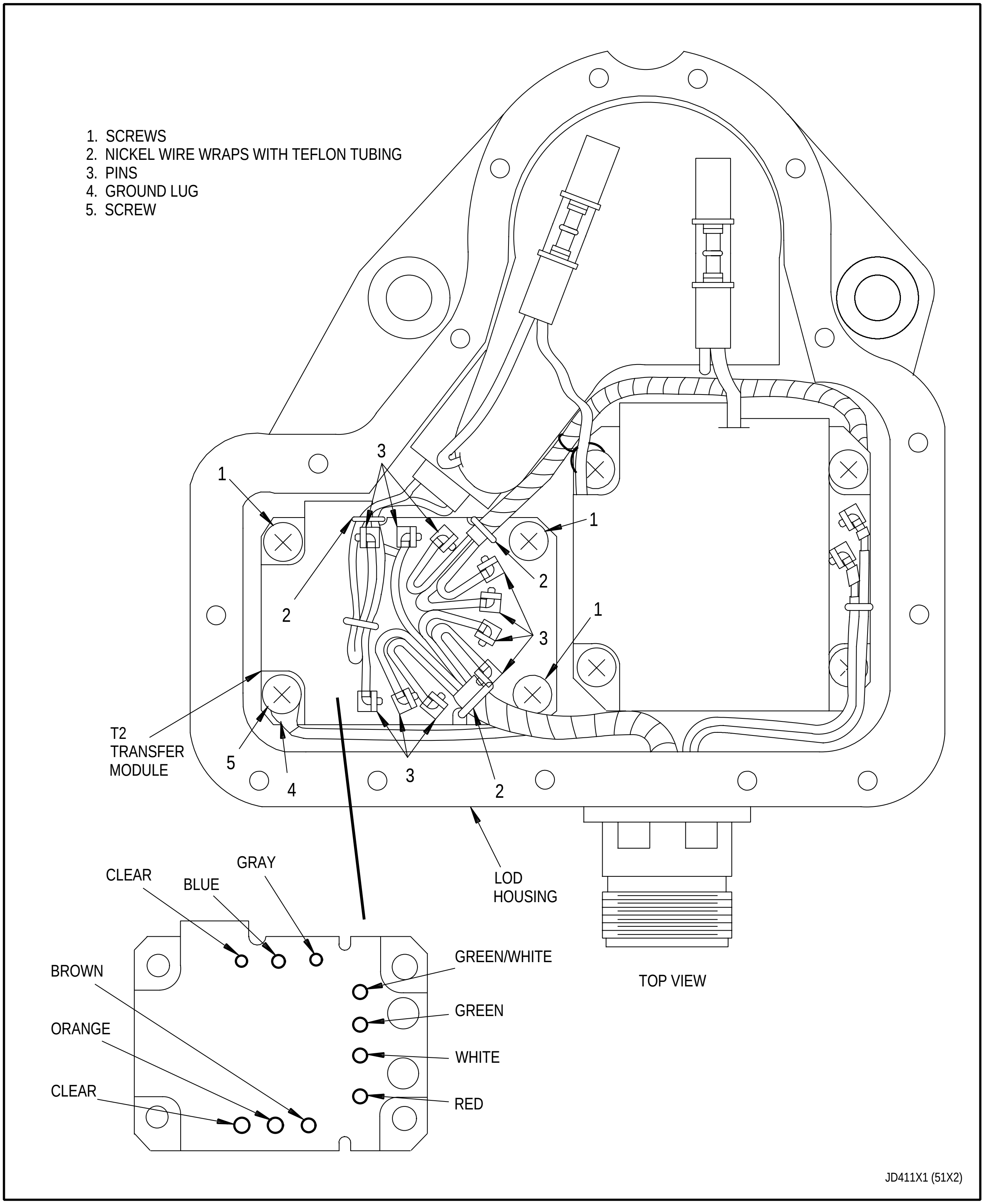


Figure 4. Augmentor Light-Off Detector - T2 Module Replacement

7. AUGMENTOR LIGHT-OFF DETECTOR - CONNECTOR ASSEMBLY REPLACEMENT. (See Figure 5 and table 1.)

a. Remove screws and washers from LOD cover.

b. Remove cover and discard gasket.

c. Remove mounting screw(5, figure 5), and disconnect ground lug(4) from T2 module assembly.

d. Note locations of nickel wire covered with teflon tubing. Cut nickel wire(2).

e. Use plastic pliers to disconnect two connector assembly pins(1) from T1 module assembly sockets and five connector assembly pins(3) from T2 module assembly sockets.

f. Remove screws from connector assembly, and pull connector assembly and wires through LOD housing. Discard gasket.

g. Position PN 910092117 gasket on connector assembly.

h. Check keyway position, and thread wires into LOD housing; seat connector assembly and gasket on LOD housing.

i. Apply Loctite 272 to screw threads.

j. Secure connector assembly with screws. Torque screws to 4 pound-inches, then to 8 pound-inches.

k. Install protective cover on connector assembly.

l. Connect five connector assembly pins(3) to T2 module assembly sockets and two connector assembly pins(1) to T1 module assembly sockets.

m. Connect ground lug(4) to T2 module assembly and install screw(5).

CAUTION

Do not allow nickel wire to contact pins, or LOD will short.

n. Install nickel wire(2) covered with teflon tubing, two places.

o. Apply Loctite 272 to screw threads.

p. Position cover and PN 910093102 gasket on LOD housing and secure with screws and washers. Torque screws to 10 pound-inches, then to 16 pound-inches.

q. Perform LOD functional test. (See table 1.)

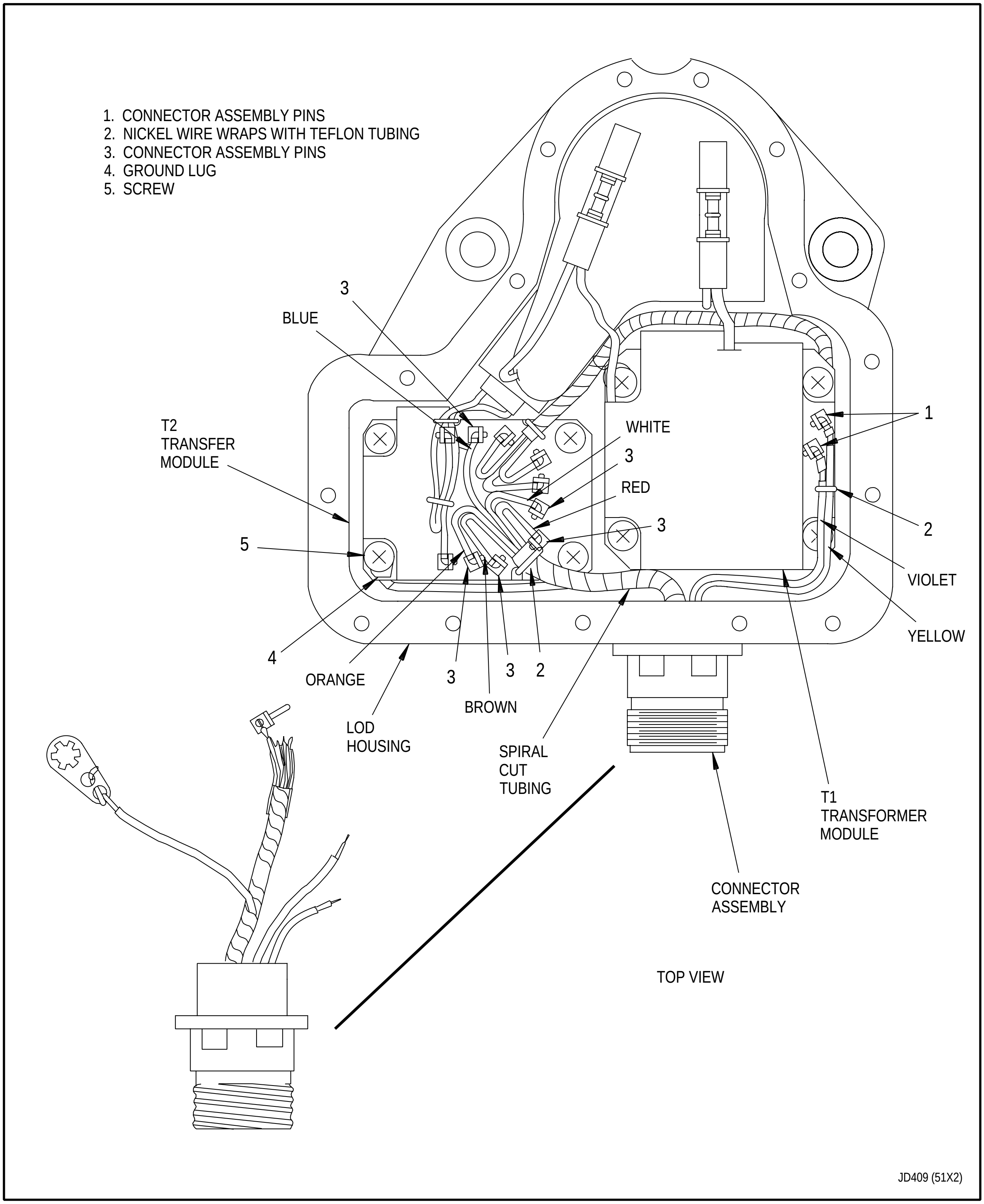


Figure 5. Augmentor Light-Off Detector - Connector Assembly Replacement

8. AUGMENTOR LIGHT-OFF DETECTOR - SENSOR SOURCE ASSEMBLY REPLACEMENT. (See Figure 6.)

a. Remove unserviceable sensor source assembly as follows:

(1) Remove screws and washers from LOD cover.

(2) Remove cover and discard gasket.

(3) Unwrap silicon rubber padding. Note location of nickel wire wraps, teflon tubing, and tape.

(4) Cut nickel wire wraps(1, figure 6, Sheet 1) covered with teflon tubing and unwrap tape.

(5) Slide teflon tube sleeves(4) back to expose T1 module assembly and sensor source assembly pin connections.

(6) Use plastic pliers to disconnect two sensor source assembly pins(2) from T1 module assembly socket and two sensor source assembly pins(3) from T2 module assembly socket.

(7) Remove gray RTV compound from two set screw holes to expose heads of set screws. Ensure all RTV is removed from hex opening in head of set screws.

NOTE

One of set screw holes may not have a set screw installed.

(8) Remove set screws carefully by inserting hex key that is in good condition into set screw opening and while maintaining steady insertion force in set screw, turn set screw until removed.

(9) With set screws removed, remove bezel assembly using PWA 57744 LOD torque adapter. Retain same spacer and shims together with removed bezel assembly.

(10) Remove gray RTV compound from bezel and housing threads using wooden or plastic type stick, stiff non-metallic brush and dry cloth.

(11) Remove screws securing sensor source assembly from housing. Remove sensor source assembly from LOD.

b. Install serviceable sensor source assembly as follows:

CAUTION

Exercise care when securing sensor source assembly screws to prevent tube damage.

(1) Install sensor source assembly into LOD housing and secure with screws through lens area. Torque screws to 10 pound-inches, then to 16 pound-inches.

(2) Clean tube using cotton swab or lint-free cloth moistened with isopropyl alcohol TT-I-735 Grade A or PMC 9016. Wipe dry with clean lint-free cloth.

(2a) Clean bezel lens using cotton swab or lint-free cloth moistened with isopropyl alcohol Grade A or PMC 9016. If necessary to remove residual deposits, use petroleum solvent P-D-680, Type II or Type III followed by isopropyl alcohol TT-I-735 Grade A, or PMC 9016. Wipe dry with clean lint-free cloth.

(3) Visually inspect sensor source filament. Replace if necessary.

(4) Apply DC 1204 primer to bezel threads, housing threads and into two housing set screw holes. Allow primer to dry for 2 hours at room temperature.

(5) Clean inside surface of lens and dome of ultra violet sensor tube with isopropyl alcohol and lint-free cloth.

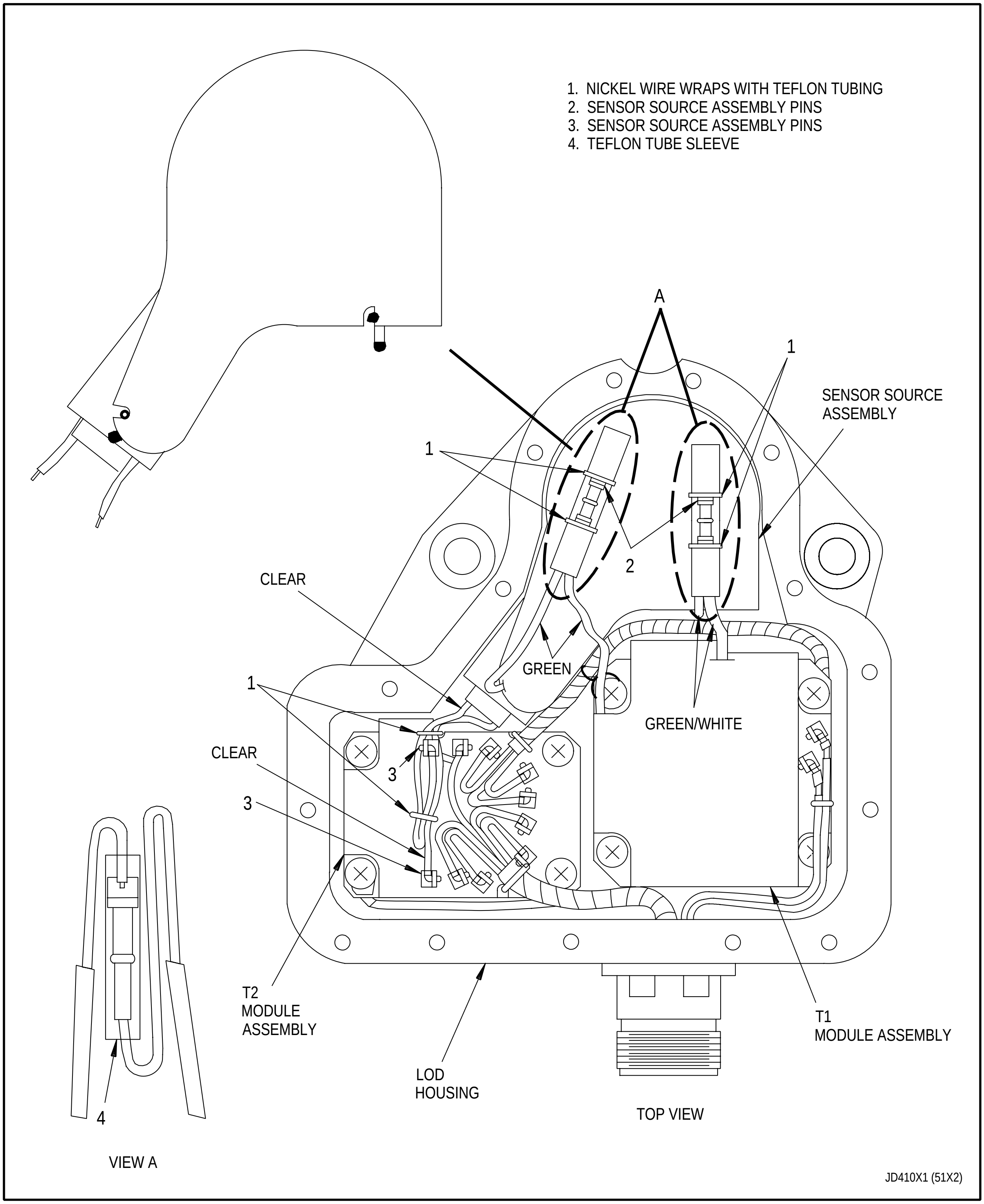


Figure 6. Augmentor Light-Off Detector - Sensor Source Assembly Replacement (Sheet 1 of 2)

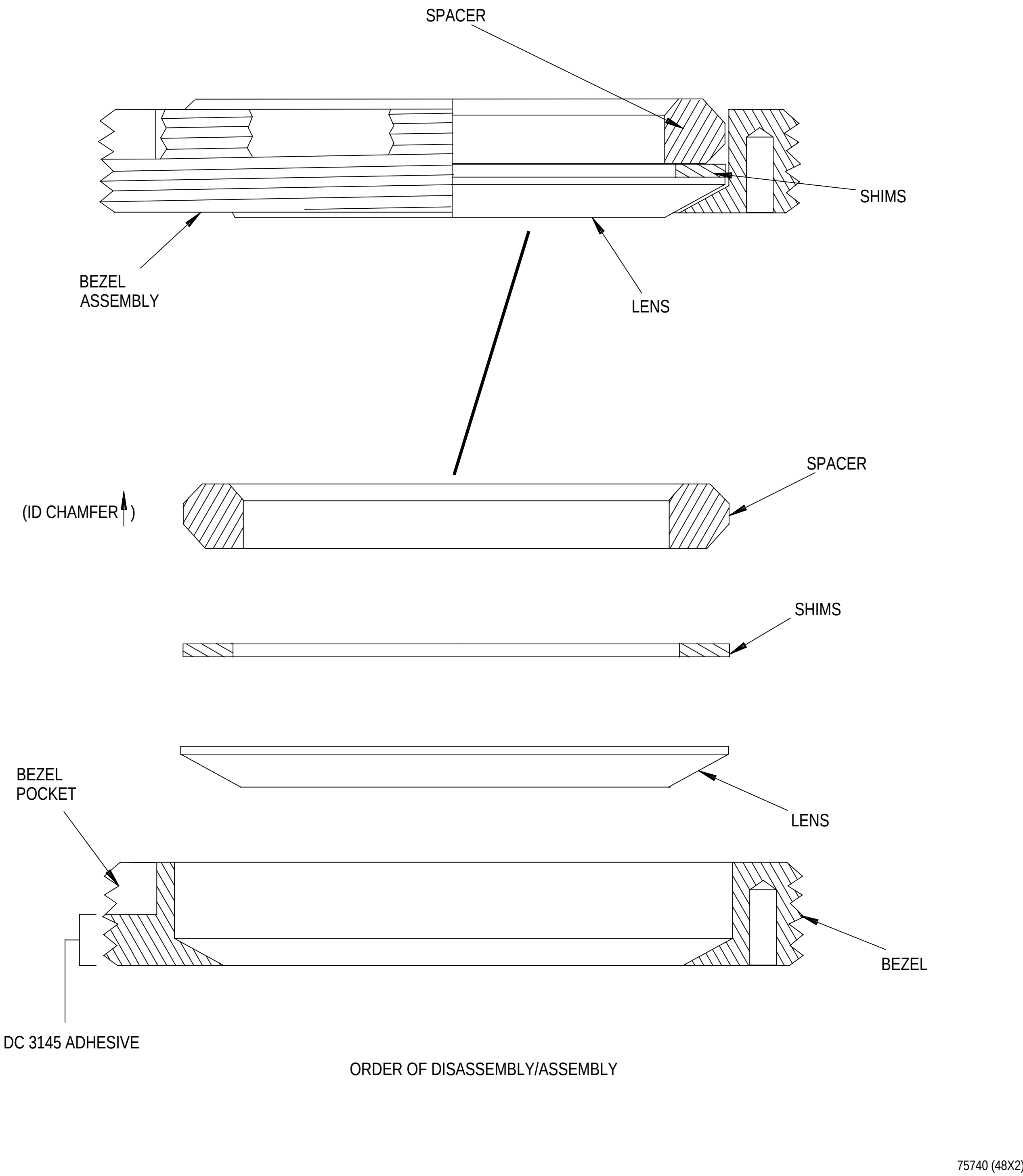


Figure 6. Augmentor Light-off Detector - Bezel Disassembly/Assembly (Sheet 2 of 2)

(6) Clean shims and place inside bezel on top of cleaned lens. Clean spacer and place on top of shims with ID chamfer side up. See figure 6, sheet 2.

(7) Hold LOD face down (with housing threads facing floor) and screw assembled spacer, shims, and bezel into housing half way (until bezel pockets are not visible). Apply bead of DC 3145 adhesive to exposed bezel threads.

(8) Screw bezel into housing hand tight using PWA 57744 LOD torque adapter.

(9) Turn housing over and continue tightening bezel to 20 pound-inches torque. Note alignment of bezel scribe marks and housing scribe mark at each set screw hole location.

(10) If one or both housing scribe marks align with bezel marks, apply small amount of DC 3145 adhesive in set screw hole and install only one set screw. Tighten screw to 1 pound-inch.

(11) If housing scribe marks do not align continue torquing bezel until alignment occurs. Do not exceed 40 pound-inches and do not back off torque to achieve alignment. Install only one set screw. Tighten screw to 1 pound-inch.

(12) Apply small amount of DC 3145 adhesive to unused set screw hole and over hole containing set screw.

(13) Wipe off all excess adhesive from around bezel and set screw holes.

(14) Allow adhesive to cure for 96 hours minimum at room temperature.

(15) After curing adhesive, clean outside surface of lens with isopropyl alcohol and clean lint free cloth.

(16) Connect sensor source assembly pins(2 and 3, figure 6, Sheet 1) to T1 and T2 module assembly sockets.

(17) Fold wires into position. (See figure 6, View A.)

(18) Replace teflon tube sleeve(4).

(19) Wrap pin connections with tape.

CAUTION

Do not allow nickel wire to contact pins. Contact will cause damage to unit.

(20) Install nickel wire(1) covered with teflon tubing two places.

(21) Cut two pieces of silicon rubber padding, 4 inches by 1.5 inches.

(22) Wrap nickel wire wraps, teflon tube sleeve, and tape with silicon rubber padding. (See View A.)

(23) Apply Loctite 272 to screw threads.

(24) Position cover and PN 910093102 gasket on LOD housing and secure with screws and washers. Torque screws to 10 pound-inches, then to 16 pound-inches.

c. Perform LOD functional test. (See paragraph 10.)

9. AUGMENTOR LIGHT-OFF DETECTOR - INSTALLATION.
(See Figure 7.)

a. Install augmentor light off detector to engine and engage three studs.

b. Lightly coat studs with PWA 550 antigalling compound.

c. Install three nuts and washers, torque nuts 62 to 72 pound-inches.

d. Remove protective closure from electrical receptacle and connect electrical cable connector P116 as follows:

(1) Align keyways and handtighten connector.

(2) Ensure red line on receptacle is not visible when viewed at right angles.

(3) Tighten connector firmly with self-jawed pliers.

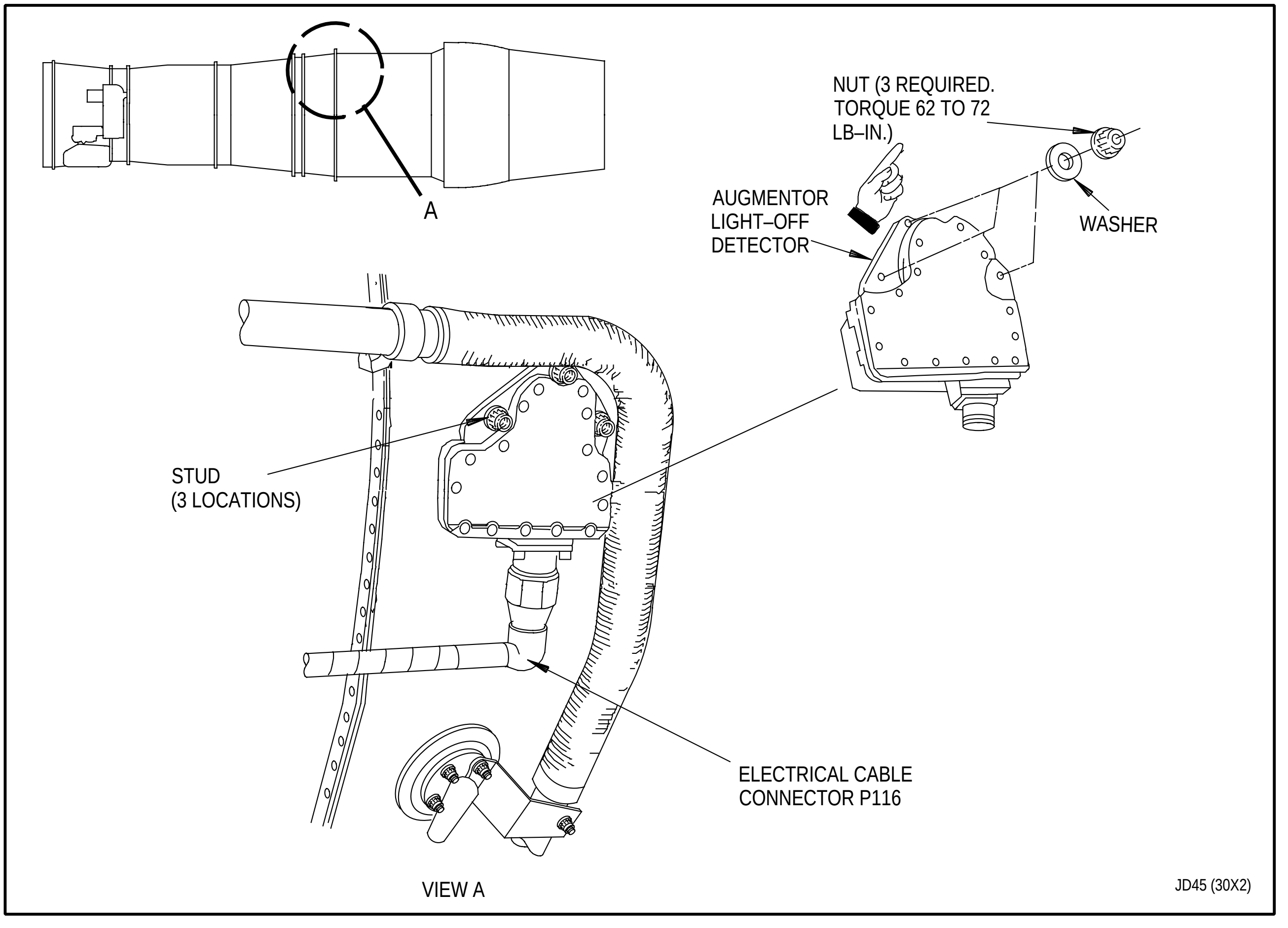


Figure 7. Augmentor Light-Off Detector - Installation

10. AUGMENTOR LIGHT-OFF DETECTOR - MODULE FAULT ISOLATION TEST.
(See Figure 8 and table 1.)

a. Fault isolate detector modules. (See figure 8 and table 1.)

Table 1. Augmentor Light-off Detector - Module Fault Isolation Test

Step	Procedure	Result	Corrective Action
1.	a. Connect ohmmeter to connector pins A and C.	3.4 to 3.7 ohms	Go to step 2. If not within range, go to step 1.b.
	b. Disconnect P4 from T2. Connect ohmmeter to J4 and connector pin A.	3.4 to 3.7 ohms	Replace connector. If not within range, go to step 1.c.
	c. Disconnect P10 from T2. Connect ohmmeter to P10 and connector pin A.	0.4 to 0.7 ohm	Replace T2. If not within range, go to step 1.d.
	d. Disconnect P9 from T2. Connect ohmmeter to J9 and connector pin A.	0.0 to 0.1 ohm	Replace T1. If not within range, go to step 1.e.
	e. Disconnect P6 from T2. Connect ohmmeter to P6 and connector pin A.	0.0 to 0.1 ohm	Replace T2. If not within range, replace connector.
2.	a. Connect ohmmeter to connector pins B and C.	3.4 to 3.7 ohms	Go to step 3. If not to within range, go to step 2.b.
	b. Disconnect P4 from T2. Connect ohmmeter to J4 and connector pin B.	3.4 to 3.7 ohms	Replace connector. If not within range, go to step 2.c.
	c. Disconnect P10 from T2. Connect ohmmeter to P10 and connector pin B.	0.4 to 0.7 ohm	Replace T2. If not within range, go to step 2.d.
	d. Disconnect P8 from T2. Connect ohmmeter to J8 and connector pin B.	0.0 to 0.1 ohm	Replace T1. If not within range, go to step 2.e.
	e. Disconnect P7 from T2. Connect ohmmeter to P7 and connector pin B.	0.0 to 0.1 ohm	Replace T2. If not within range, replace connector.
3.	a. Connect ohmmeter to connector pins F and C.	6.0 to 7.4 ohms	Go to step 4. If not within range, go to step 3.b.
	b. Disconnect P4 from T2. Connect ohmmeter to J4 and connector pin F.	6.0 to 7.4 ohms	Replace connector. If not within range, go to step 3.c.
	c. Disconnect P11 from T2. Connect ohmmeter to P11 and connector pin F.	0.0 to 0.1 ohm	Replace T2. If not within range, replace connector.

Table 1. Augmentor Light-off Detector - Module Fault Isolation Test (continued)

Step	Procedure	Result	Corrective Action
4.	a. Connect ohmmeter to connector pins G and C.	6.0 to 7.4 ohms	Go to step 5. If not within range, go to step 4.b.
	b. Disconnect P4 from P2. Connect ohmmeter to J4 and connector pin G.	6.0 to 7.4 ohms	Replace connector. If not within range, go to step 4.c.
	c. Disconnect P5 from T2. Connect ohmmeter to P5 and connector pin G.	0.0 to 0.1 ohm	Replace T2. If not within range, replace connector.
5.	a. Connect ohmmeter to connector pins D and E.	5.94 to 6.06 kilo ohms	Go to step 6. If not within range, go to step 5.b.
	b. Disconnect P1 from T1. Connect ohmmeter to J1 and connector pin E.	5.94 to 6.06 kilo ohms	Replace connector. If not within range, go to step 5.c.
	c. Disconnect P2 from T1. Connect ohmmeter to J1 and J2.	5.94 to 6.06 kilo ohms	Replace connector. If not within range, replace T1.
6.	a. Connect ohmmeter to connector pins D and C.	Greater than 20 megohms	Go to step 7. If less than 20 megohms, go to step 6.b.
	b. Disconnect P10 from T2. Connect ohmmeter to P10 and connector pin D.	Greater than 20 megohms	Replace connector. If less than 20 megohms, replace T1.
7.	a. Connect ohmmeter to connector pin A and LOD case.	Greater than 20 megohms	Go to step 8. If less than 20 megohms, go to step 7.b.
	b. Disconnect P6 from T2. Connect ohmmeter to J6 and LOD case.	Greater than 20 megohms	Replace connector. If less than 20 megohms, go to step 7.c.
	c. Disconnect P9 from T2. Connect ohmmeter to P9 and LOD case.	Greater than 20 megohms	Replace T2. If less than 20 megohms, go to step 7.d.
	d. Disconnect P4 from T2. Connect ohmmeter to P9 and LOD case.	Greater than 20 megohms	Replace connector. If less than 20 megohms, go to step 7.e.
	e. Disconnect P5 from T2. Connect ohmmeter to P9 and LOD case.	Greater than 20 megohms	Replace connector. If less than 20 megohms, go to step 7.f.
	f. Disconnect P7 from T2. Connect ohmmeter to P9 and LOD case.	Greater than 20 megohms	Replace connector. If less than 20 megohms, go to step 7.g.
	g. Disconnect P11 from T2. Connect ohmmeter to P9 and LOD case.	Greater than 20 megohms	Replace connector. If less than 20 megohms, go to step 7.h.

Table 1. Augmentor Light-off Detector - Module Fault Isolation Test (continued)

Step	Procedure	Result	Corrective Action
7. (cont'd)	h. Disconnect P8 from T2. Connect ohmmeter to P9 and LOD case.	Greater than 20 megohms	Replace T2. If less than 20 megohms, go to step 7.i.
	i. Disconnect P10 from T2. Connect ohmmeter to P9 and LOD case.	Greater than 20 megohms	Replace T2. If less than 20 megohms, replace T1.
8.	a. Connect ohmmeter to connect pin D and LOD case.	Greater than 20 megohms	Go to step 9. If less than 20 megohms, go to step 8.b.
	b. Disconnect P1 from T1. Connect ohmmeter to J1 and LOD case.	Greater than 20 megohms	Replace connector. If less than 20 megohms, go to step 8.c.
	c. Disconnect P2 from T1. Connect ohmmeter to J1 and LOD case.	Greater than 20 megohms	Replace connector. If less than 20 megohms, go to step 8.d.
	d. Disconnect P13 from T1. Connect ohmmeter to J1 and LOD case.	Greater than 20 megohms	Replace sensor source. If less than 20 megohms, go to step 8.e.
	e. Disconnect P14 from T1. Connect ohmmeter to J1 and LOD case.	Greater than 20 megohms	Replace sensor source. If less than 20 megohms, replace T1.
9.	a. Connect ohmmeter to connector pin H and ground lug.	0.0 to 0.1 ohm	Go to step 10. If not within range, go to step 9.b.
	b. Connect ohmmeter to connector pin H and ground lug.	0.0 to 0.1 ohm	Repair connection by ensuring ground lug is clean and properly grounded. If not within range, replace connector.
10.	a. Connect ohmmeter to P12 and LOD case.	Greater than 20 megohms	Go to step 11. If less than 20 megohms, go to step 10.b.
	b. Connect P12 from T2. Connect ohmmeter to P12 and LOD case.	Greater than 20 megohms	Go to step 10.c. If less than 20 megohms, replace sensor source.
	c. Disconnect P3 from T2. Connect ohmmeter to P3 and LOD case.	Greater than 20 megohms	Replace T2. If less than 20 megohms, replace sensor source.
11.	a. Disconnect P12 from T2. Connect ohmmeter to J12 and P3.	34.7 to 35.5 kilo ohms	Go to step 12. If not within range, replace T2.
12.	a. Disconnect P13 and P14 from T1. Connect ohmmeter to J13 to J14.	95.2 to 97.1 kilo ohms	Replace sensor source. If not within range, replace T1.

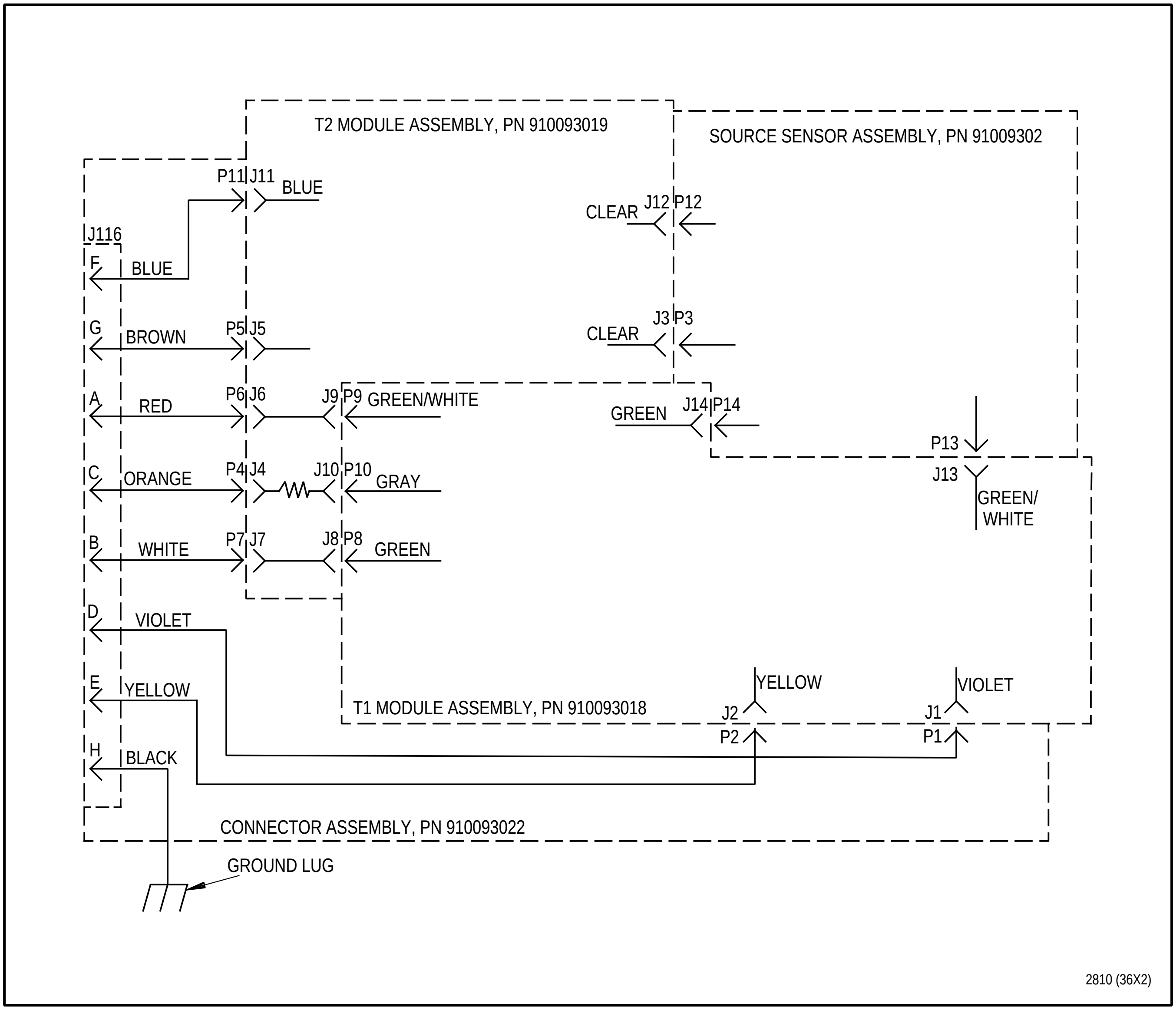


Figure 8. Augmentor Light-off Detector - Module Fault Isolation Test

WORK PACKAGE

TECHNICAL PROCEDURES

SHAFTS - FLEXIBLE, PRIMARY AND SECONDARY ACTUATOR, CONVERGENT NOZZLE

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 24

PAGE NO.	CHANGE NO.
1 - 2	20
3	0
4	18
5	0
6	18
7 - 10	6
11 - 12	0
13	6
14	18
14A - 14B Added	6
15 - 16	6
16A Added	6
16B Blank Added	6
17	6
18	18
19	5
20 Blank	6

REFERENCE MATERIAL REQUIRED

None

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
BRUSH, NONMETALLIC STIFF BRISTLE	-
CLOTH, LINT-FREE	-
CLOTH, SILK OR NYLON	-
COMPOUND, ANTIGALLING (PWA 36035)	FEL-PRO C-300
GREASE	BRAYCOTE 602, 615, OR 620, OR MOLYKOTE HP-300
LOCKWIRE(0.020 INCH DIAMETER)	MS9226-02

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
COTTER PIN	MS9245-28	5
RING, RETAINING	2646556	AS REQUIRED

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures for the convergent nozzle primary and secondary actuator flexible shafts:

- Removal
- Disassembly
- Cleaning
- Inspection
- Assembly
- Installation
- Follow-on maintenance

2. CONVERGENT NOZZLE PRIMARY ACTUATOR FLEXIBLE SHAFTS - REMOVAL.

(See Figure 1.)

WARNING

Lubricating grease on convergent nozzle primary actuator flexible shafts may produce highly toxic fluorine compounds when heated. Direct contact with grease may cause irritation to skin and eyes. Avoid sources of heat. Follow good hygiene practices. Wear protective clothing/equipment. Avoid heating or burning anything contaminated with grease.

a. Remove nut and bolt holding clamp in place on forward end of convergent nozzle primary actuator flexible shafts.

CAUTION

Failure to hold bushing hex when loosening jamnuts may cause damage to shaft tube.

b. Loosen jamnuts on aft ends of primary shafts.

NOTE

Do not remove bolts lockwired with aluminum seal.

c. Remove two bolts holding adapters to ball screw actuator. Do not remove two bolts lockwired withaluminum seal.

d. Slide adapters forward and remove cotter pins. Discard cotter pins. Disengage shafts from splines of actuator.

e. Loosen couplings on forward ends of primary shafts. Slide couplings back and disconnect shafts from convergent exhaust nozzle control. Remove shafts.

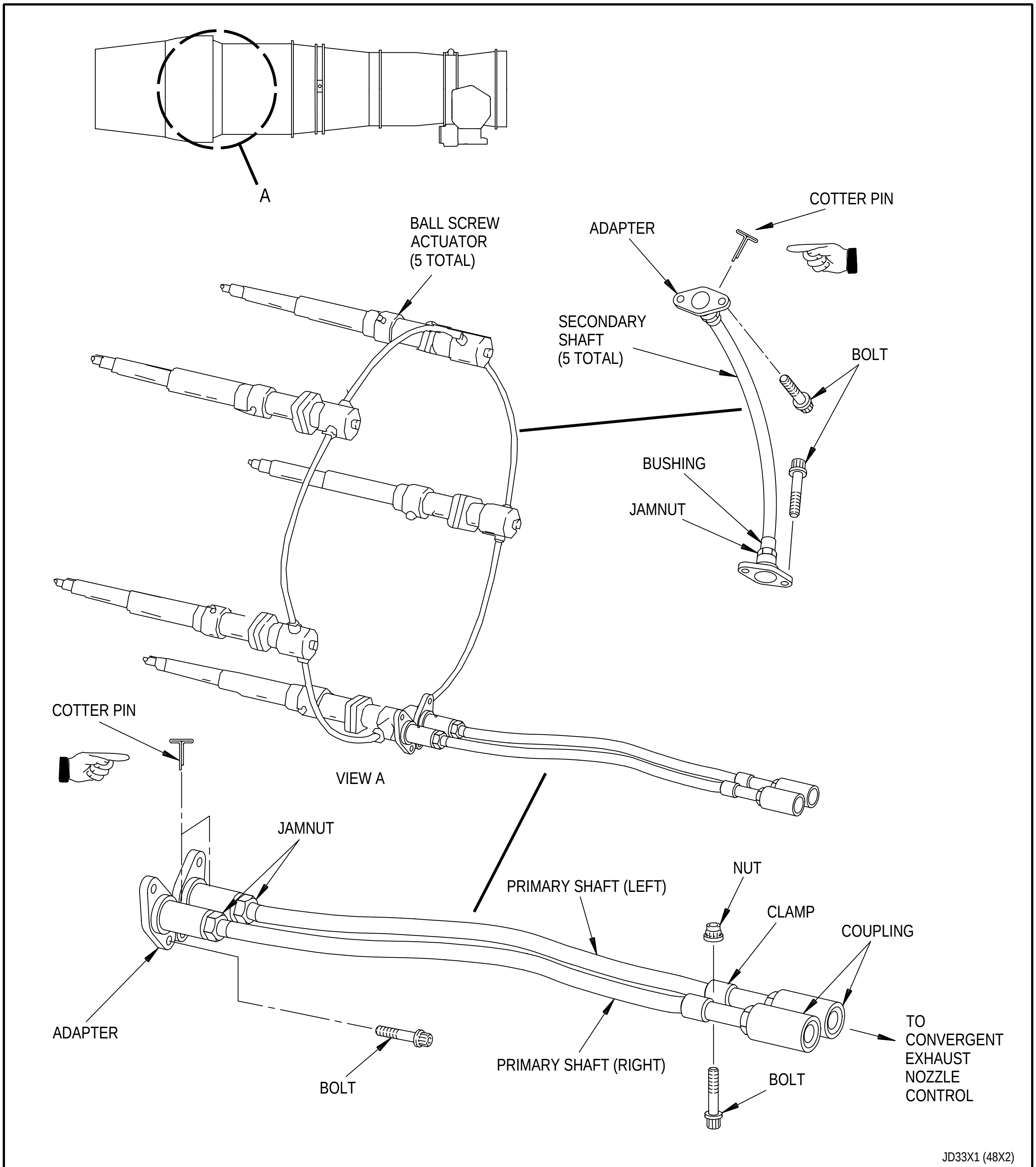


Figure 1. Convergent Nozzle Primary and Secondary Actuator Flexible Shafts - Removal

3. CONVERGENT NOZZLE SECONDARY ACTUATOR FLEXIBLE SHAFTS - REMOVAL. (See figure 1.)

WARNING

Lubricating grease on convergent nozzle primary actuator flexible shafts may produce highly toxic fluorine compounds when heated. Direct contact with grease may cause irritation to skin and eyes. Avoid sources of heat. Follow good hygiene practices. Wear protective clothing/equipment. Avoid heating or burning anything contaminated with grease.

CAUTION

Failure to hold bushing hex when loosening jamnuts may cause damage to shaft tube.

a. Loosen jamnuts by holding bushing hex, not shaft tube, when loosening jamnuts on adapters at each end of secondary shaft.

b. Remove two bolts holding adapters to actuators at end of each primary shaft. Do not remove two bolts lockwired withaluminum seal.

CAUTION

Failure to remove cotter pin and disengage rigid shaft coupling from actuator splined shaft before removal of flex shaft from actuator may result in shaft housing damage.

c. Slide adapters away from actuators and remove cotter pin. Discard cotter pin. Disengage shaft from actuator and remove shaft.

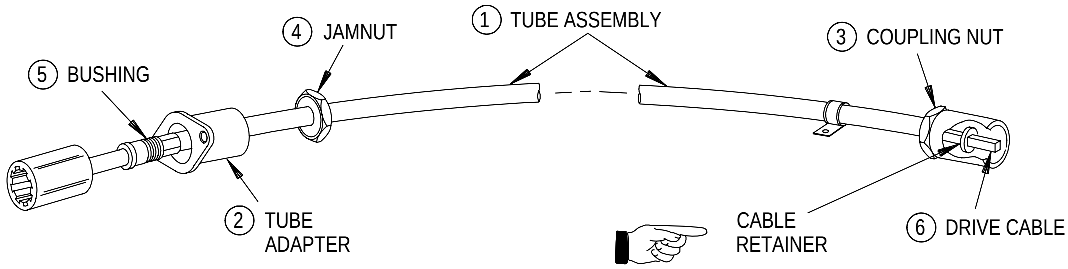
4. CONVERGENT NOZZLE PRIMARY AND SECONDARY ACTUATOR FLEXIBLE SHAFTS (ASSEMBLED)- INSPECTION. (See Figures 2, 3, and 4.)

WARNING

Lubricating grease on convergent nozzle primary actuator flexible shafts may produce highly toxic fluorine compounds when heated. Direct contact with grease may cause irritation to skin and eyes. Avoid sources of heat. Follow good hygiene practices. Wear protective clothing/equipment. Avoid heating or burning anything contaminated with grease.

a. Inspect convergent nozzle primary and secondary actuator flexible shafts. (See figures 2, 3, and 4.)

b. Ensure shafts are internally lubricated with grease.Grease should be visible on drive cable between cable retainer and bushing on opposite end of shaft. Grease should not be visible on the drive cable ends. If grease is not visible inside each end of the shaft, disassemble, clean, inspect, and assemble flexible shaft. Refer to paragraphs 5, 6, 7, and 8.

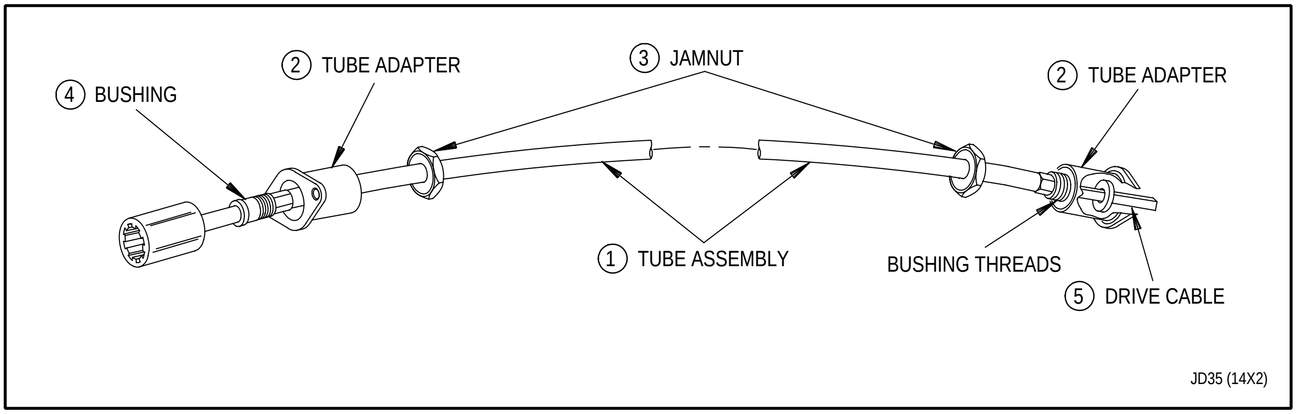


Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Tube assembly -			
Deformed, bent, dented	Serviceable if drive cable does not contact inner wall of tube assembly.	Not reparable	Remove, clean and inspect drive cable per paragraphs 5, 6, and 7. Replace complete flexible shaft if drive cable is unserviceable or shows evidence of contact with tube assembly.
Cracked, worn through	Not serviceable	Not reparable	Replace complete flexible shaft.
2. Tube adapter -			
Cracked, deformed, damaged bolt holes	Not serviceable	Not reparable	Replace complete flexible shaft.
3. Coupling nut -			
Cracked, deformed, damaged threads	Not serviceable	Not reparable	Replace complete flexible shaft.

Figure 2. Convergent Nozzle Primary Actuator Flexible Shaft - Inspection

Legend for figure 2 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
4. Jamnut -			
Cracked	Not serviceable	Not reparable	Replace complete flexible shaft.
Threads stripped or damaged	Not serviceable	Not reparable	Replace complete flexible shaft.
Lockwire holes unserviceable	Not serviceable	Not reparable	Replace complete flexible shaft.
5. Bushing -			
Threads stripped or damaged	Not serviceable	Not reparable	Replace complete flexible shaft.
Excessive end play	0.030 inch per figure 4	Not reparable	Replace complete flexible shaft.
6. Primary drive cable -			
One cable broken	Not serviceable	Not reparable	Replace complete flexible shaft.
Both cables broken	Not serviceable	Not reparable	Replace both drive cables. Inspect nozzle primary and secondary actuators for driveshaft twisting per WP 043 00
Both cables broken (Second occurrence within 50 hours)	Not serviceable	Not reparable	Replace both drive cables and covergent exhaust nozzle control per WP 044 00. Inspect nozzle primary and secondary actuators for driveshaft twisting per WP 043 00.



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Tube assembly -			
Deformed, bent, dented, cracked	Serviceable if drive cable does not contact inner wall of tube assembly.	See corrective action.	Remove, clean and inspect drive cable per paragraphs 5, 6, and 7. Replace complete flexible shaft if drive cable is unserviceable or shows evidence of contact with tube assembly.
Cracked worn through	Not serviceable	Not reparable	Replace complete flexible shaft.
2. Tube adapter -			
Cracked, deformed, damaged bolt holes	Not serviceable	Not reparable	Replace complete flexible shaft.

Figure 3. Convergent Nozzle Secondary Actuator Flexible Shaft - Inspection

Legend for figure 3 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
3. Jamnut -			
Cracked	Not serviceable	Not reparable	Replace complete flexible shaft.
Threads stripped or damaged	Not serviceable	Not reparable	Replace complete flexible shaft.
Lockwire holes unserviceable	Not serviceable	Not reparable	Replace complete flexible shaft.
4. Bushing -			
Threads stripped or damaged	Not serviceable	Not reparable	Replace complete flexible shaft.
Excessive end play	0.030 inch per figure 4	Not reparable	Replace complete flexible shaft.
5. Drive cable -			
Broken	Not serviceable	Not reparable	Replace complete flexible shaft.

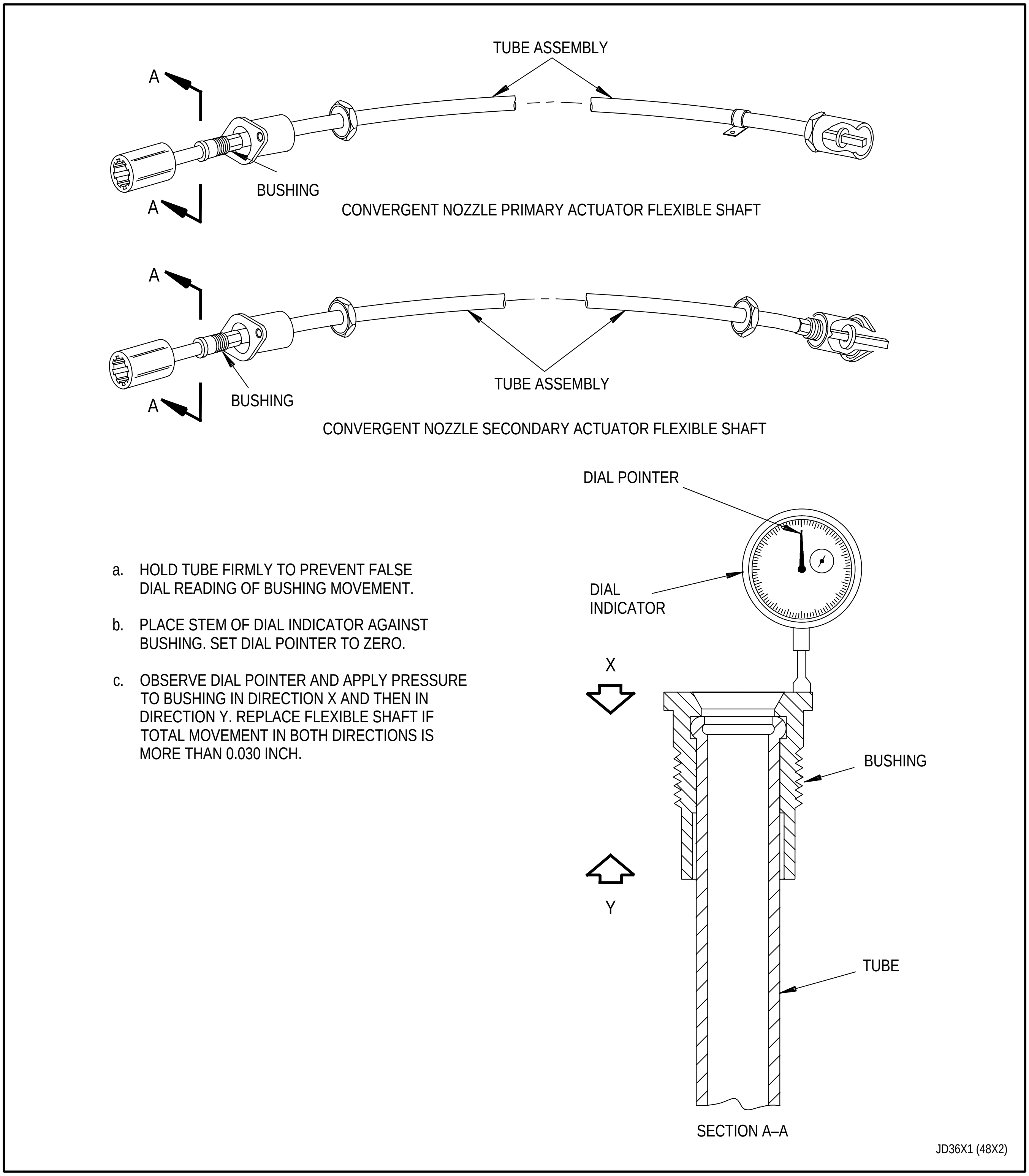


Figure 4. Convergent Nozzle Primary and Secondary Actuator Flexible Shaft - Bushing End Play Inspection

5. CONVERGENT NOZZLE PRIMARY AND SECONDARY ACTUATOR FLEXIBLE SHAFTS - DISASSEMBLY.

(See Figures 5 and 6.)

CAUTION

Disassembled parts of shaft assembly shall be kept together in sets. Do not mix parts from different shaft assemblies.

a. Remove spring pin from drive coupling of convergent nozzle primary actuator flexible shaft. (See figure 5.)

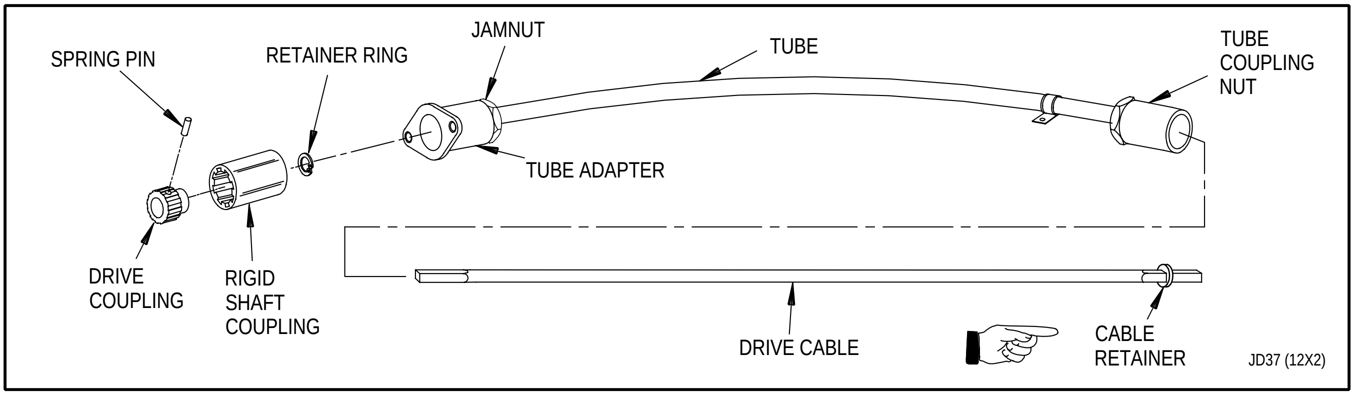


Figure 5. Convergent Nozzle Primary Actuator Flexible Shaft - Disassembly

b. Remove drive coupling and rigid shaft coupling.

CAUTION

Do not remove retainer ring from rigid shaft coupling unless insecure or damaged. Retainer ring shall be replaced with new one if removed for any reason.

c. If necessary, remove retainer ring from rigid shaft coupling.

d. Pull out drive cable from opposite end of primary shaft.

e. Place removed parts in a container and label container right or left primary shaft, as applicable.

f. Repeat steps a. through e. for remaining primary actuator flexible shaft.

g. Remove spring pin from convergent nozzle secondary actuator flexible shaft. (See figure 6.)

h. Remove drive coupling and rigid shaft coupling.

i. If necessary, remove retainer ring from rigid shaft coupling.

j. Pull out drive cable from opposite end of secondary shaft.

k. Place removed parts in a container and label container as No. 1, 2, 3, 4, or 5 secondary shaft, as applicable.

l. Repeat steps g. through k. for remaining secondary shafts.

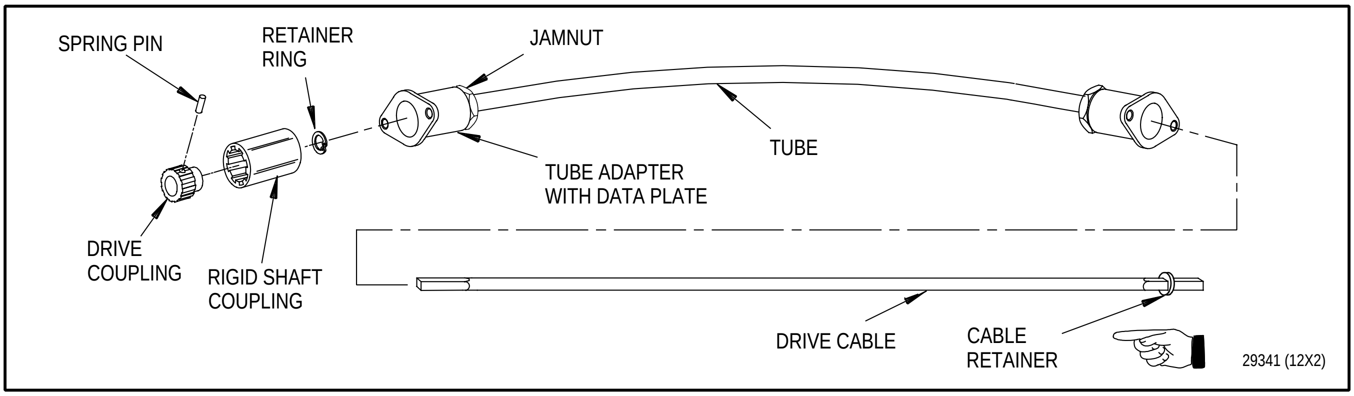


Figure 6. Convergent Nozzle Secondary Actuator Flexible Shaft - Disassembly

6. CONVERGENT NOZZLE PRIMARY AND SECONDARY ACTUATOR FLEXIBLE SHAFTS - CLEANING.

(See figures 5 and 6.)

WARNING

Lubricating grease on convergent nozzle primary actuator flexible shafts may produce highly toxic fluorine compounds when heated. Direct contact with grease may cause irritation to skin and eyes. Avoid sources of heat. Follow good hygiene practices. Wear protective clothing/equipment. Avoid heating or burning anything contaminated with grease.

a. Force a silk or nylon cloth through primary and secondary flexible shaft tubes to remove most of lubricant. (See figures 5 and 6.)

b. Wipe lubricant off the primary and secondary flexible shaft details with a rag. Cleaning with a solvent is not necessary.

7. CONVERGENT NOZZLE PRIMARY AND SECONDARY ACTUATOR FLEXIBLE SHAFT DETAILS (DISASSEMBLED)- INSPECTION. (See Figure 7 and 7A.)

NOTE

Inspect convergent nozzle primary shaft per step a. and convergent nozzle secondary shaft per step b.

a. Inspect disassembled details of primary and secondary actuator flexible shafts. (See figure 7.)

(1) Replace complete flexible shaft if drive cable is broken completely or has broken, missing, or cracked strands.

(2) Replace drive cable if it has any of the following conditions:

(a) Cable strands are worn flat and the normal groove between adjacent strands no longer exists. (See figure 7A.)

(b) Cable strands splayed or spread relative to each other (see figure 7A).

(c) Cable square drive ends non-uniform or tapered over length of drive end.

(d) Cable square drive ends having worn corners in excess of 0.015 inch radius.

(e) Fixed cable retainer is worn or loose.

(f) Clean rusted areas on drive cable per paragraph 6. If rust remains on or between strands after cleaning, replace drive cable.

(3) Replace rigid shaft coupling if damaged or if splines are worn. Clean rusted areas on coupling per paragraph 6. If rust remains after cleaning, replace rigid shaft coupling.

(4) Replace retainer ring if it is damaged or loose.

(5) Replace complete flexible shaft if drive coupling is damaged or if splines are worn.

(6) Replace spring pin if damaged or missing.

b. Inspect convergent nozzle secondary actuator flexible shaft details as follows: (See figure 7.)

(1) Replace complete flexible shaft if any of the following conditions exist.

(a) Drive cable strands are worn flat and the normal groove between adjacent strands no longer exists. (See figure 7A.) Clean rusted areas on drive cable per paragraph 6. Replace complete flexible shaft if rust remains after cleaning.

(b) Drive cable is broken completely or has broken, missing or cracked strands.

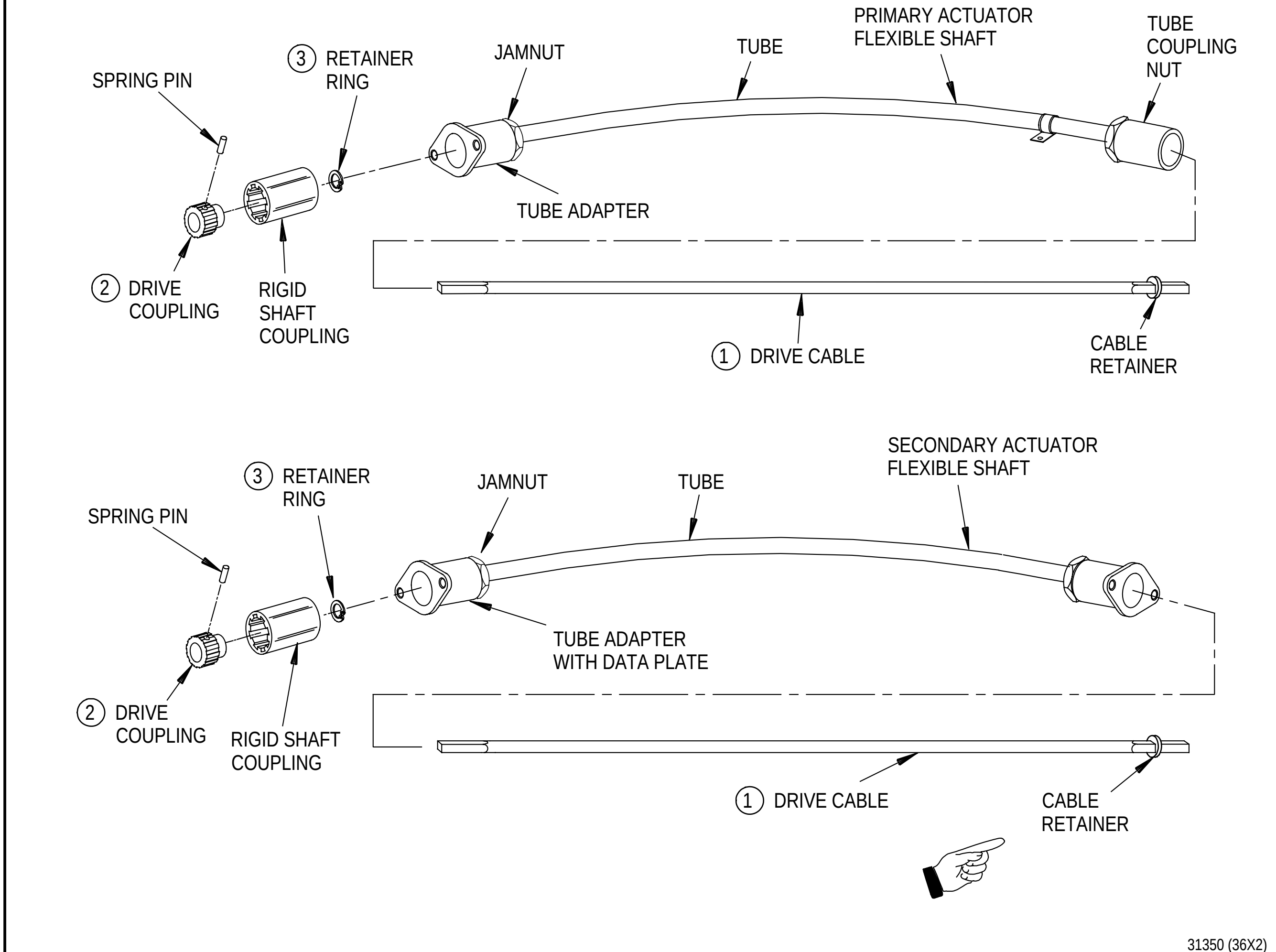
(c) Cable strands are splayed or spread relative to each other. (See figure 7A.)

(d) Rigid shaft coupling is damaged or splines are worn. Clean rusted areas on coupling per paragraph 6. Replace complete flexible shaft if rust remains after cleaning.

(e) Drive coupling is damaged or splines are worn.

(2) Replace retainer ring if damaged or loose.

(3) Replace spring pin if damaged or missing.



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Drive cable -			
Broken, missing strands, flat or worn spots, rust	Not serviceable	Not reparable	Replace entire flexible shaft.
2. Drive coupling -			
Damaged, worn splines	Not serviceable	Not reparable	Replace entire flexible shaft.
3. Retainer ring (installed) -			
Damaged, loose	Not serviceable	Not reparable	Replace ring.

Figure 7. Convergent Nozzle Primary and Secondary Actuator Flexible Shaft Details - Inspection

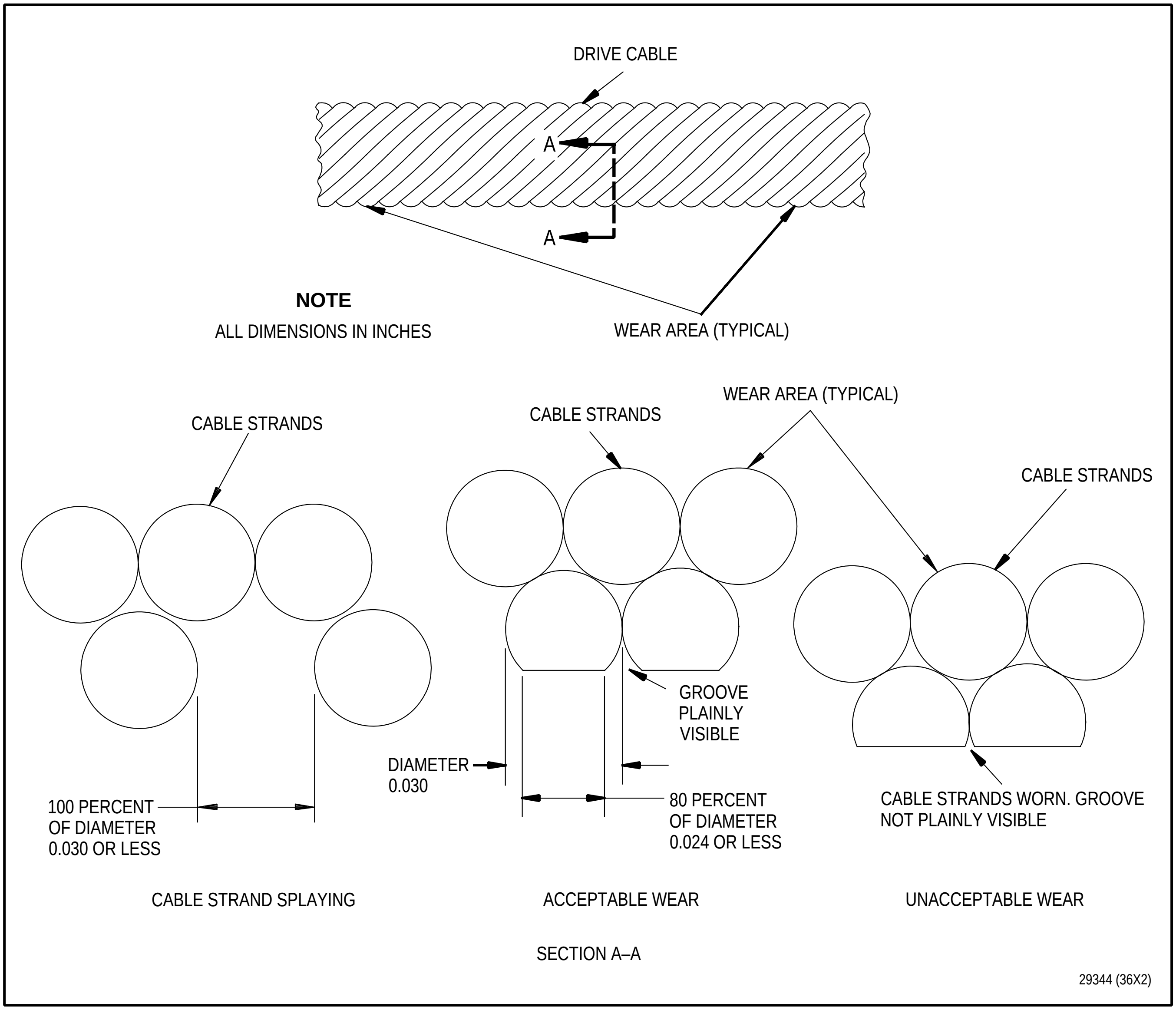


Figure 7A. Drive Cable Strand Wear - Inspection

8. CONVERGENT NOZZLE PRIMARY AND SECONDARY ACTUATOR FLEXIBLE SHAFTS - ASSEMBLY.
(See Figures 8 and 9.)

CAUTION

- Do not intermix parts of the primary and secondary actuator flexible shafts. The augmentor nozzle and the actuators can be severely damaged by even a minor dimensional difference caused by intermixing parts.
- Do not use force to install retainer rings if it is necessary to replace them. Make sure rings are not bent or distorted.

a. If it is necessary to replace retainer rings, install new Bendix PN 2646556 retainer ring in rigid shaft coupling.

b. Loosen jamnut and slide adapters back over tubes.

c. Lubricate drive cable with 5.0 cubic centimeters of grease using a tongue depressor. Ensure grease is applied evenly and covers cable per figure 8 and 9. Work any excess grease toward middle of cable so it will not contaminate anyone when shaft is assembled.

d. Thread end of drive cable that does not have cable retainer into end of tube that has coupling nut. For primary flexible shaft or has tube adapter without data plate for secondary flexible shaft. Ensure cable retainer seats firmly against tube.

e. Install rigid shaft coupling, with retainer ring toward tube, on drive cable.

f. Install drive coupling as follows:

(1) Position rigid shaft coupling on drive cable so cotter pin hole is 90 degrees from hole in cable.

(2) Line up hole in drive coupling with hole in drive cable. Engage drive coupling splines with rigid shaft coupling splines by inserting smaller end of drive coupling into rigid shaft coupling.

g. Install spring pin through holes in drive coupling and drive cable.

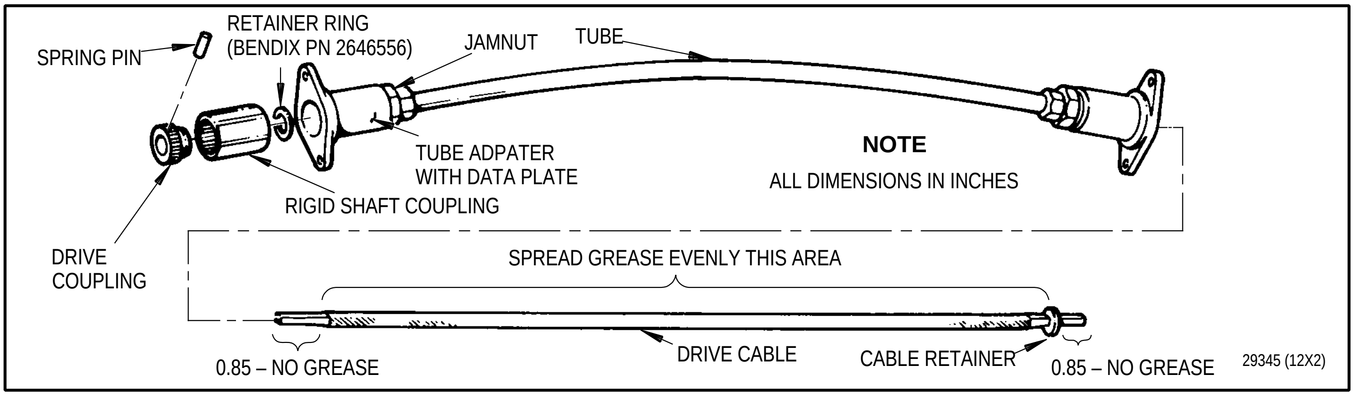


Figure 8. Convergent Nozzle Secondary Actuator Flexible Shaft - Assembly

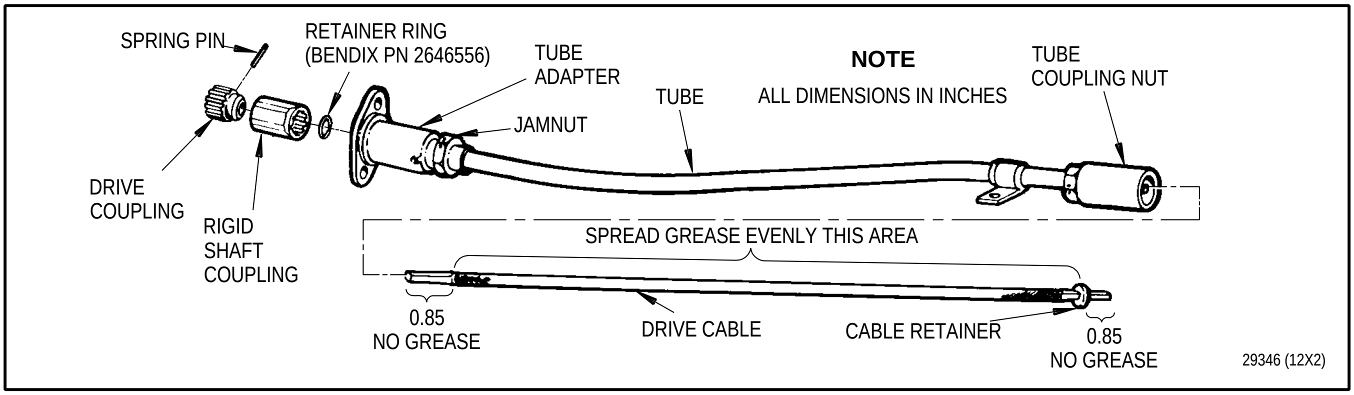


Figure 9. Convergent Nozzle Primary Actuator Flexible Shaft - Assembly

9. CONVERGENT NOZZLE SECONDARY ACTUATOR FLEXIBLE SHAFTS - INSTALLATION.

(See Figure 10.)

WARNING

Lubricating grease on convergent nozzle primary actuator flexible shafts may produce highly toxic fluorine compounds when heated. Direct contact with grease may cause irritation to skin and eyes. Avoid sources of heat. Follow good hygiene practices. Wear protective clothing/equipment. Avoid heating or burning anything contaminated with grease.

CAUTION

Failure to fully retract all actuators before installing more than one secondary actuator flexible shaft at a time may cause damage.

a. Slide jamnuts and tube adapters on secondary actuator flexible shafts back over tube assembly. (See figure 10.)

b. Insert inner square drive of shaft into square drive on side of actuator. Do not rotate actuator square drive.

c. Align rigid coupling splines on other end of shaft with splines on adjacent actuator. Do not rotate splines of actuator.

d. Align cotter pin holes in splines and coupling and slide coupling over actuator splines.

CAUTION

Failure to install and bend cotter pin ends around coupling could cause coupling to become disengaged from actuator during engine operation.

e. Install new T-shaped cotter pin and bend ends around coupling.

f. Position tube adapters against actuators.

g. Apply PWA 36035 antigalling compound to threads of bolts. Install bolt and torque. Lockwire bolts with PN MS9226-02 wire.

h. Install jamnut over bushing at each tube adapter. Hold hex on bushing and torque jamnut. Lockwire jamnut with PN MS9226-02 wire.

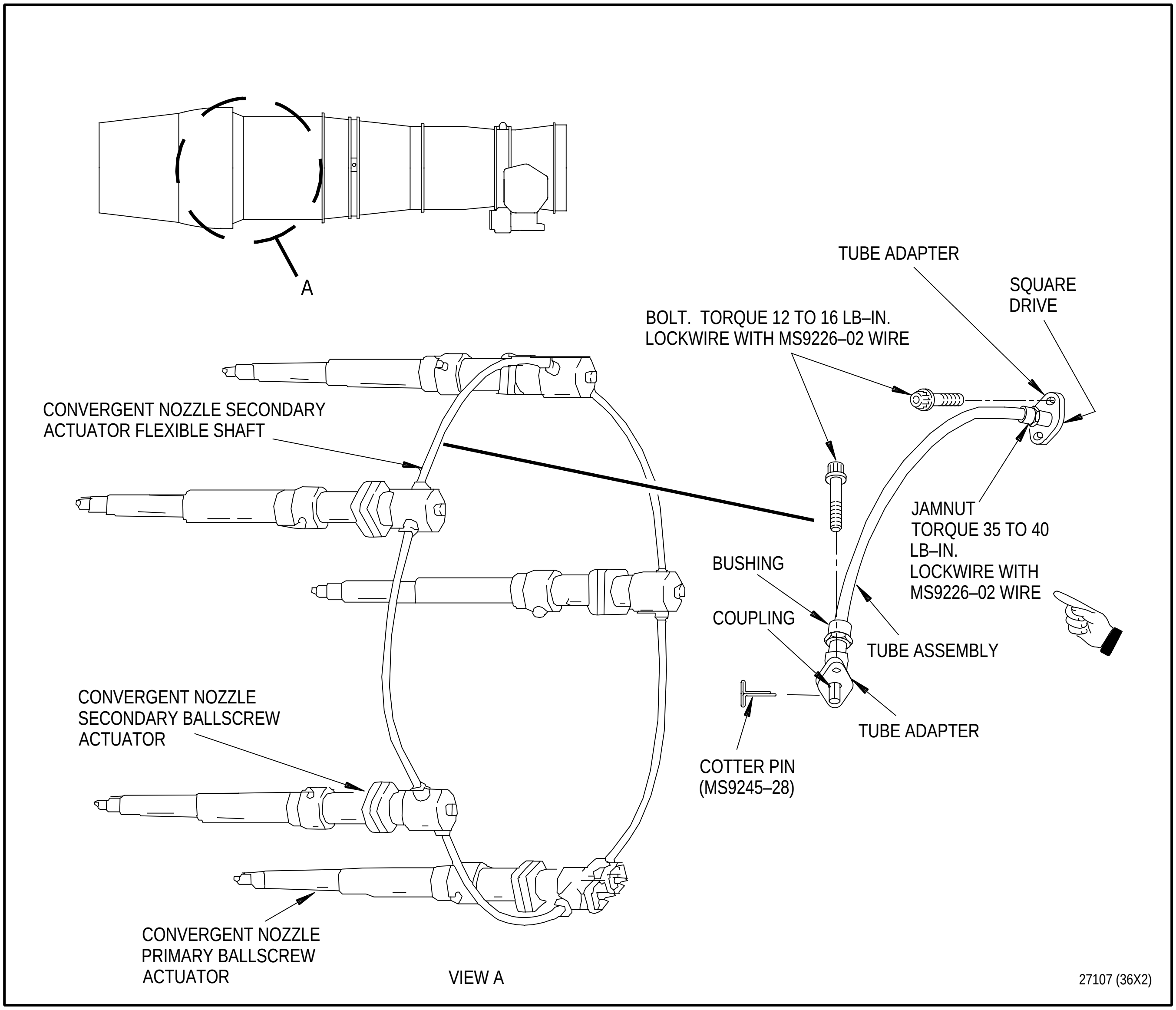


Figure 10. Convergent Nozzle Secondary Actuator Flexible Shafts - Installation

10. FOLLOW-ON MAINTENANCE.

a. Install convergent nozzle primary actuator flexible shaft and rig convergent exhaust nozzle control system. Refer to WP 103 00.

WORK PACKAGE

TECHNICAL PROCEDURES

ACTUATORS - BALL SCREW, PRIMARY AND SECONDARY, CONVERGENT NOZZLE

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 30

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 4	29	9 - 12	0	19 - 24	0
5	0	13	2	25	13
6 - 7	26	14 - 18	0	26	26
8	13	18A - 18B Added	29	27 - 28	0

REFERENCE MATERIAL REQUIRED

Title	Number
Augmentor Duct and Nozzle Module - - - - - - - - - - - - - - - -	T.O. 2J-F100-53-10
Augmentor Convergent Nozzle Area Sizing - - - - - - - - - - -	WP 702 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
CLOTH, LINT-FREE	-
COMPOUND, ANTIGALLING (PWA 36035)	FEL-PRO C-300
COMPOUND, ANTIGALLING (PWA 36545)	ESNALUBE 382
COMPOUND, ANTIGALLING (PWA 550)	HI-T-650 OR LUBRI-BOND HT
GREASE	BRAYCOTE 602EF
LOCKWIRE	MS9226-02 (0.020 INCH DIAMETER)
LOCKWIRE	MS9226-03 (0.025 INCH DIAMETER)
LOCKWIRE	MS9226-04 (0.032 INCH DIAMETER)
SOLVENT, PETROLEUM	P-D-680, TYPE II

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
COTTER PIN	MS9245-28	7
KEY WASHER	4025416	5
KEY WASHER	4052098	10

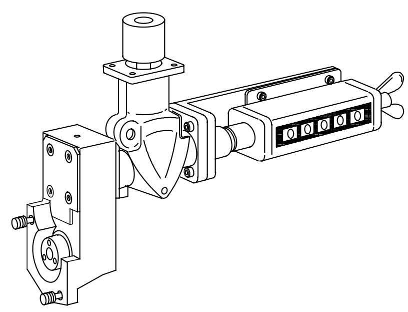
APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
2	CONVERGENT NOZZLE PRIMARY AND SECONDARY BALL SCREW ACTUATORS - REMOVAL	
	ADAPTER, AUGMENTOR NOZZLE ACTUATOR DRIVE - - - - - - -	PWA 56639
	TORQUE ADAPTER, PRIMARY CONVERGENT NOZZLE BALL SCREW ACTUATOR, TURN & COUNT - - - - - - - - - - - - - - - - - - -	PWA 51757 OR
	PIN, RIGGING SET -	PWA 57701
	FIXTURE, PRIMARY AND SECONDARY CONVERGENT NOZZLE BALL SCREW ACTUATOR -	PWA 51758

APPLICABLE SUPPORT EQUIPMENT (continued)

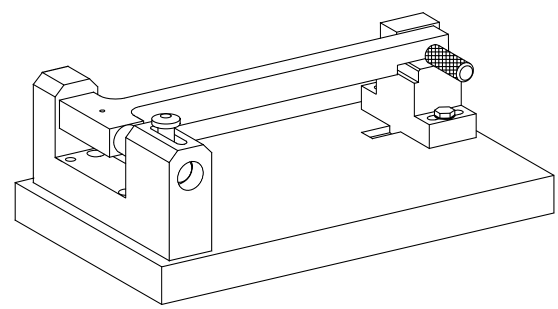
Paragraph	Function - Tool Nomenclature	Tool Number
5	CONVERGENT NOZZLE PRIMARY AND SECONDARYBALL SCREW ACTUATORS - INSTALLATION	
	FIXTURE, PRIMARY AND SECONDARY CONVERGENT NOZZLE BALL SCREW ACTUATOR -----------------------	PWA 51758
	TORQUE ADAPTER, PRIMARY CONVERGENT NOZZLE BALL SCREW ACTUATOR, TURN & COUNT --------------------	PWA 51757 OR
	PIN, RIGGING SET ------------------------	PWA 57701
	ADAPTER, AUGMENTOR NOZZLE ACTUATOR DRIVE -------	PWA 56639

ILLUSTRATED SUPPORT EQUIPMENT



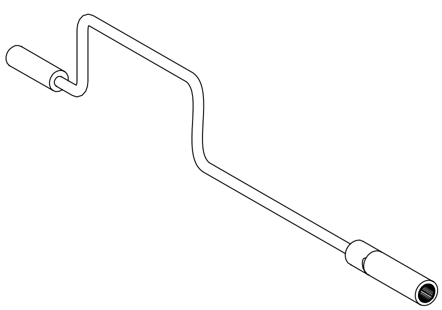
PWA 51757 –C

Figure T1. PWA 51757 TORQUE ADAPTER



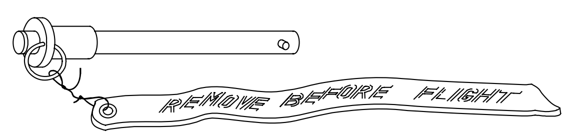
PWA 51758 –C

Figure T2. PWA 51758 FIXTURE



PWA 56639 –C

Figure T3. PWA 56639 ADAPTER



PWA 57701 –C

Figure T4. PWA 57701 PIN

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures for the convergent nozzle primary and secondary ball screw actuators:

- Removal
- Cleaning
- Inspection
- Lubrication
- Installation

2. CONVERGENT NOZZLE PRIMARY AND SECONDARY BALL SCREW ACTUATORS - REMOVAL.
(See Figures 1 through 5.)

NOTE

There are four secondary actuators and one primary actuator. If more than one has to be removed, remove and install them one at a time so the nozzle sizing will not be changed. If all the actuators are removed at the same time, the augmentor duct and nozzle module shall be removed from the engine and any necessary maintenance shall be performed.

a. Remove only primary actuator flexible input shaft from primary actuator as follows, if only a secondary actuator is being removed: (See figure 1.)

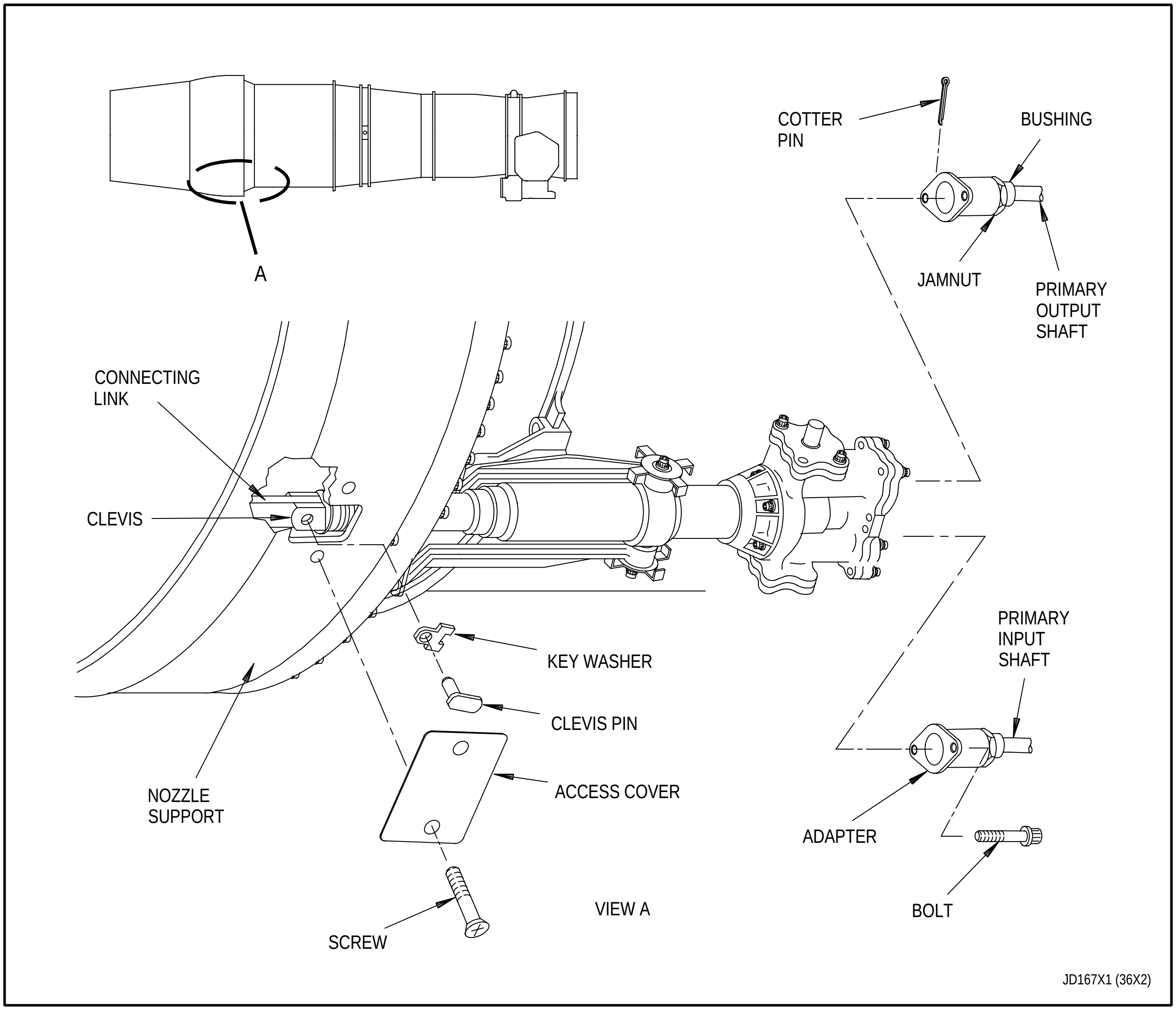


Figure 1. Convergent Nozzle Primary Actuator Flexible Shaft - Removal

(1) Loosen jamnuts by holding bushing hex, not shaft tube, when loosening primary shaft jamnuts on end of shaft next to actuator.

(2) Remove two bolts holding shaft adapter to primary actuator. Do not remove two bolts lockwired with lead seal.

(3) Slide adapter away from actuator and remove cotter pin. Discard cotter pin.

(4) Disconnect shaft from primary actuator.

(5) Loosen jamnuts on end of shaft next to convergent exhaust nozzle control.

(6) Remove bolt holding primary flex shafts together.

(7) Remove flexible shaft.

b. If primary ball screw actuator is to be removed, remove adjacent primary flexible output shaft. Refer to step a.(1) through (4).

c. Remove screws holding access cover of actuator to be removed on augmentor nozzle support. Remove access cover.

NOTE

PWA 56639 adapter may be substituted for PWA 51757 torque adapter.

d. Install PWA 51757 torque adapter, or PWA 56639 adapter on left hand feedback drive input shaft of primary actuator as applicable:

(1) Install PWA 51757 torque adapter per figure 2. Install and torque bolt details.

(2) Install PWA 56639 adapter on input shaft.

e. Install manual crank, ratchet, speed handle, air gun, or equivalent into square drive adapter.

CAUTION

Turning crank after making contact with retracted stop may damage actuator.

f. Turn square drive adapter clockwise to close nozzle. Do not turn crank once contact is made with retracted stop.

g. Install PWA 57701 rigging pin set through static structure slots and synchronizing ring. (See figure 3.)

h. Fasten length of wire around clevis pin and key washer. Hold wire and straighten tabs of key washer. Turn and carefully remove pin and key washer. Do not let pin or key washer drop into nozzle. Discard key washer. (See figure 2.)

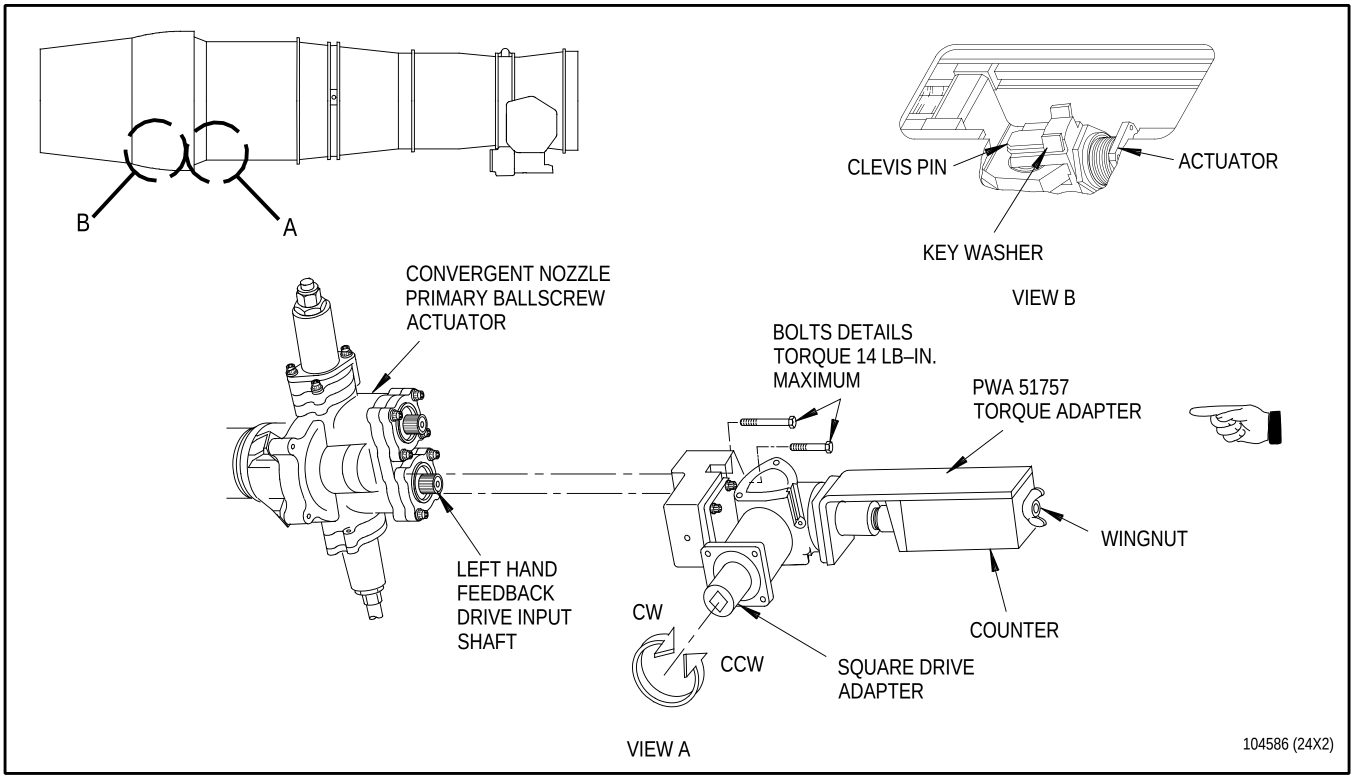


Figure 2. Cranking Primary Ball Screw Actuator With PWA 51757 Torque Adapter

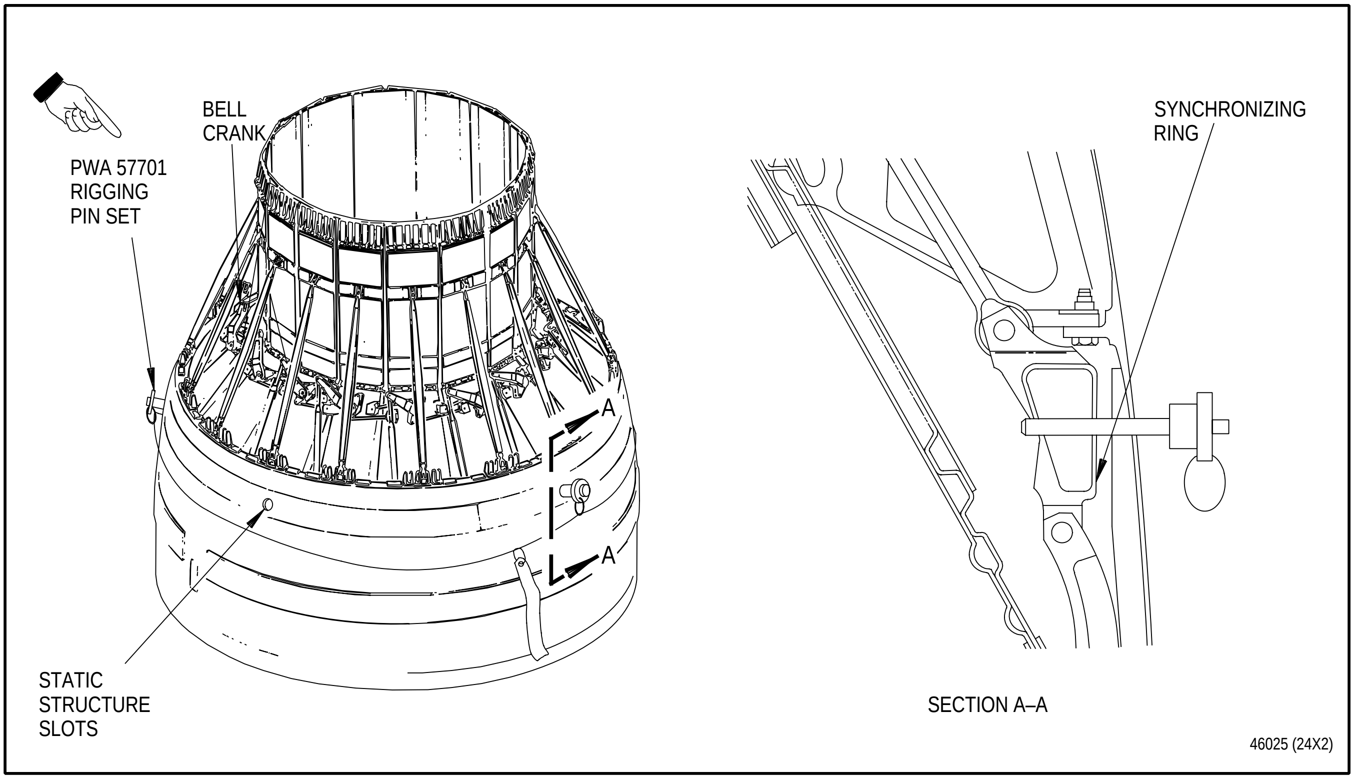


Figure 3. Augmentor Convergent Nozzle Area Sizing - Rigging Pin Installation

i. Remove secondary actuator flexible shafts from actuator that is to be removed as follows:

(1) Loosen jamnuts by holding bushing hex, not shaft tube, when loosening jamnuts on secondary actuator shaft on both sides of actuator. (See figure 4, Sheet 1.)

(2) Remove two bolts from adapters at each end of both shafts. Do not remove two bolts lockwired with lead seal.

(3) Slide jamnuts and adapters back over shafts.

(4) Remove T-shaped cotter pin from coupling at one end of each shaft. Remove shaft from both sides of actuator. Discard cotter pin.

j. Remove actuator as follows: (See figure 4, Sheet 2.)

(1) Remove bolts holding aft end of supports to flange.

(2) Remove key washer and bolt securing one actuator support to actuator.

(3) Remove bolts and nuts holding side of support with bolt and key washer removed.

(4) Separate support from actuator.

(5) While holding actuator, remove key washer and bolt from remaining support and remove actuator.

(6) Remove bolts and nuts securing remaining support to augmentor duct.

(7) Remove support.

(8) Remove spring seat and spring from actuator.

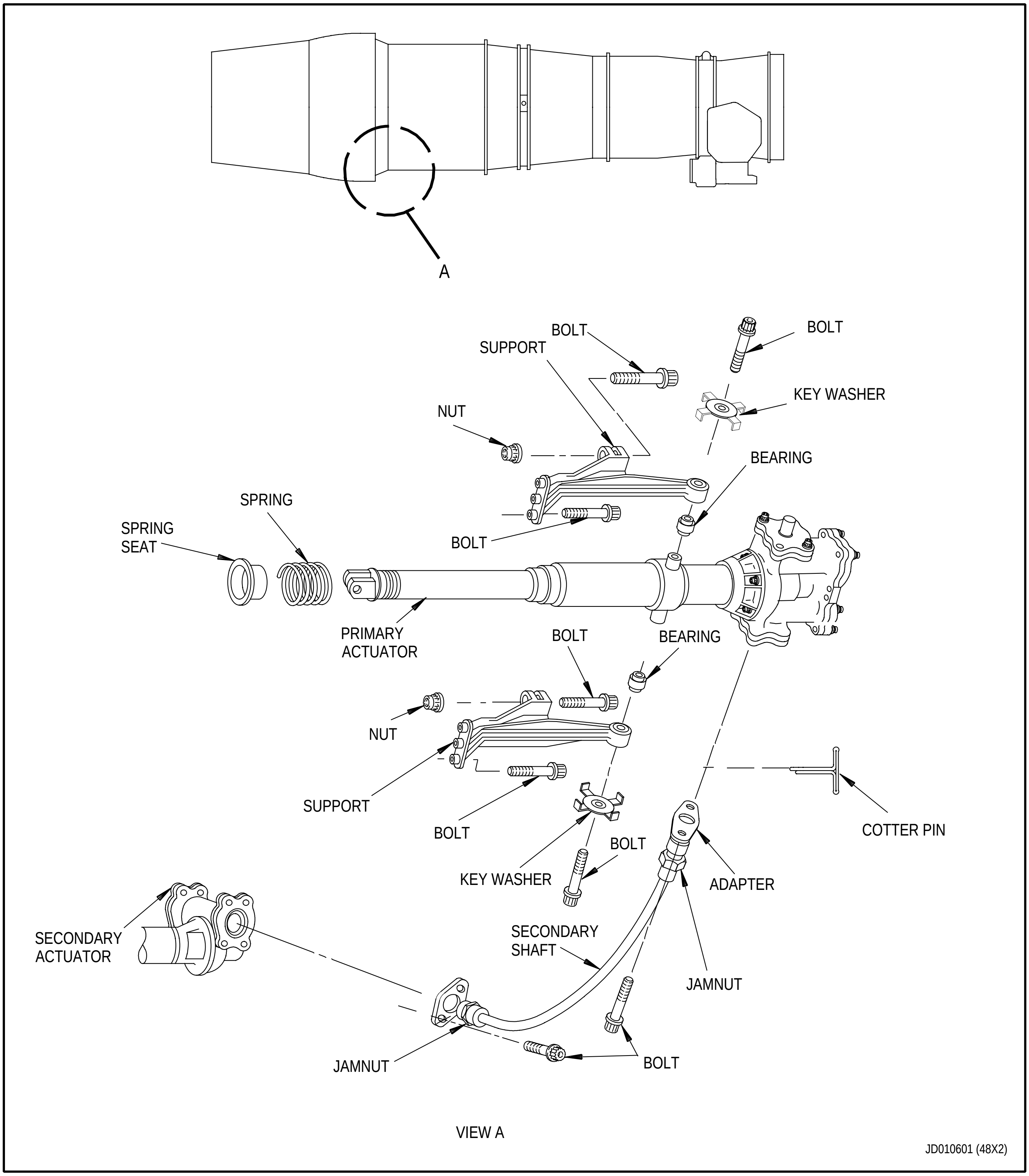


Figure 4. Convergent Nozzle Primary and Secondary Ball Screw Actuators - Removal (Sheet 1 of 2)

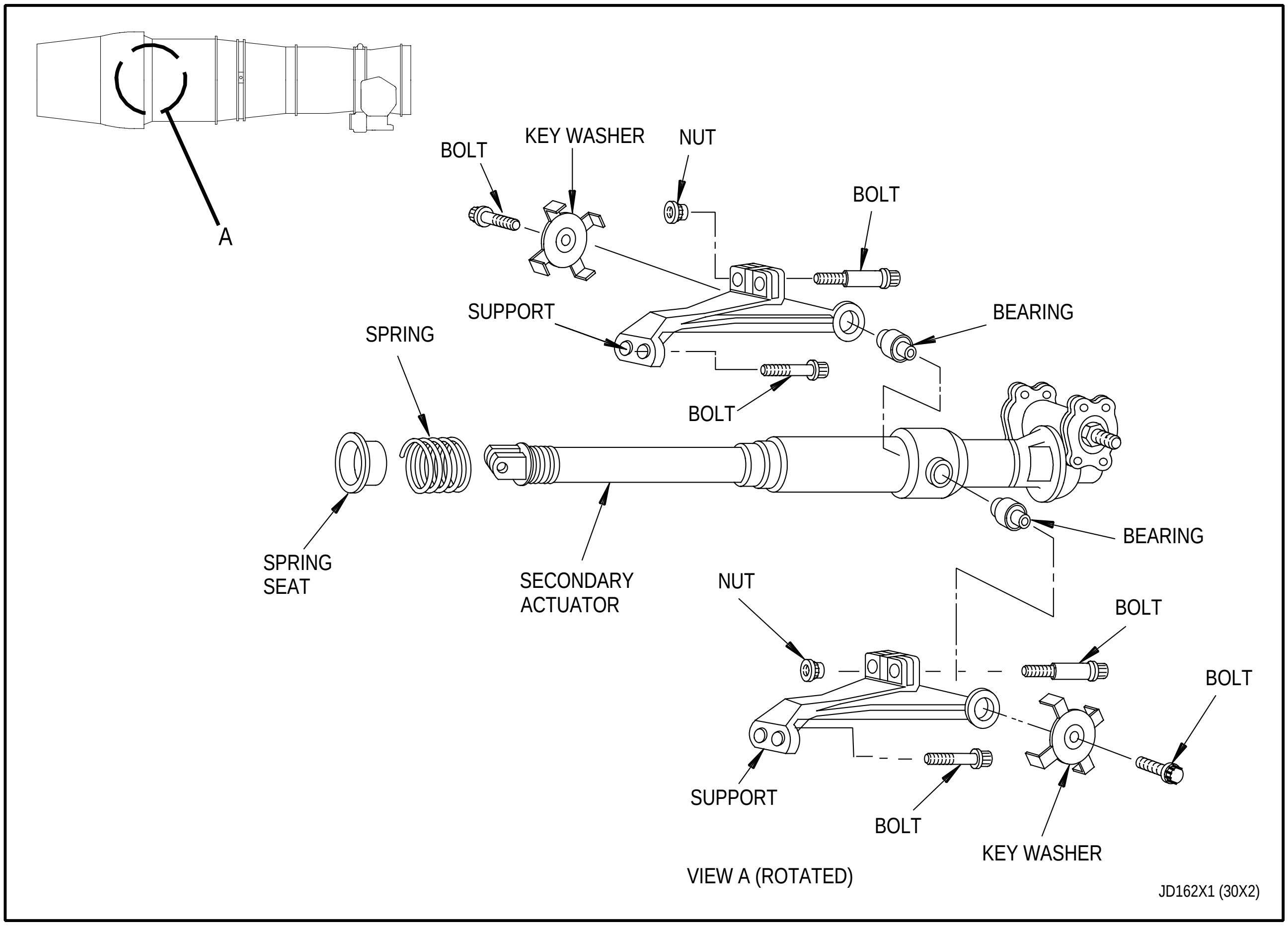


Figure 4. Convergent Nozzle Primary and Secondary Ball Screw Actuators - Removal (Sheet 2 of 2)

CAUTION

When an actuator is replaced, its clevis adjustment shall be indexed. The replacement actuator shall have the same clevis adjustment as the one removed.

k. Index removed actuator as follows:

(1) Using manual crank, turn square drive on side of actuator until actuator is at its shortest length (contact is made with stop).

(2) Loosen hand knob and cap screws of PWA 51758 fixture. (See figure 5.) Remove pin from fixture.

(3) Place actuator in block of fixture so that bearings of actuator line up with hole in block and hole in clamp. (See figure 5.)

(4) Slide clamp toward actuator until actuator is supported at bearings. Tighten hand knob of block.

(5) Line up hole in adjustable block with holes in clevis of actuator.

(6) Insert pin of fixture through clevis and into hole of adjustable block.

(7) Fasten adjustable block in place by tightening cap screws.

(8) Remove pin, loosen hand knob and remove actuator from fixture.
Replace pin in fixture.

(9) Make a notation on a tag identifying indexed actuator. Tag fixture so that it will not be reused.

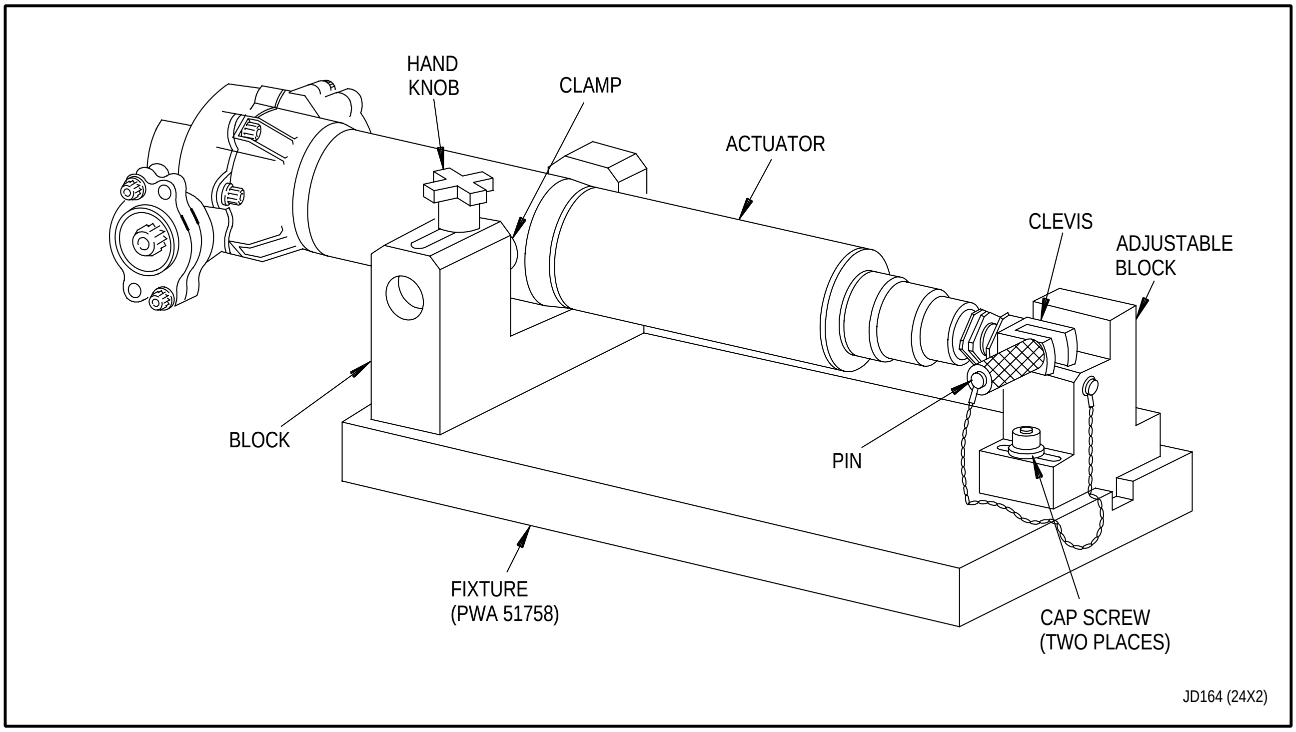


Figure 5. Indexing Convergent Nozzle Primary and Secondary Ball Screw Actuators

3. CONVERGENT NOZZLE PRIMARY AND SECONDARY BALL SCREW ACTUATORS - CLEANING.

a. Using a clean cloth moistened with P-D-680, Type II petroleum solvent, wipe the outside of primary or secondary actuator.

b. Wipe dry with a clean lint-free cloth.

4. CONVERGENT NOZZLE PRIMARY AND SECONDARY BALL SCREW ACTUATORS - INSPECTION.
(See Figures 6 and 7.)

a. Inspect primary and secondary actuators. (See figure 6.)

b. Inspect spring seat. (See figure 7.)

c. Rusted actuator support mounting bolts are serviceable if wrenching flats are not damaged.

d. Perform a functional check of the primary and secondary actuators as follows:

(1) For primary and secondary actuators, use a standard ratchet and crank actuator from stop to stop. If binding or rough movement occurs while cranking, replace actuator.

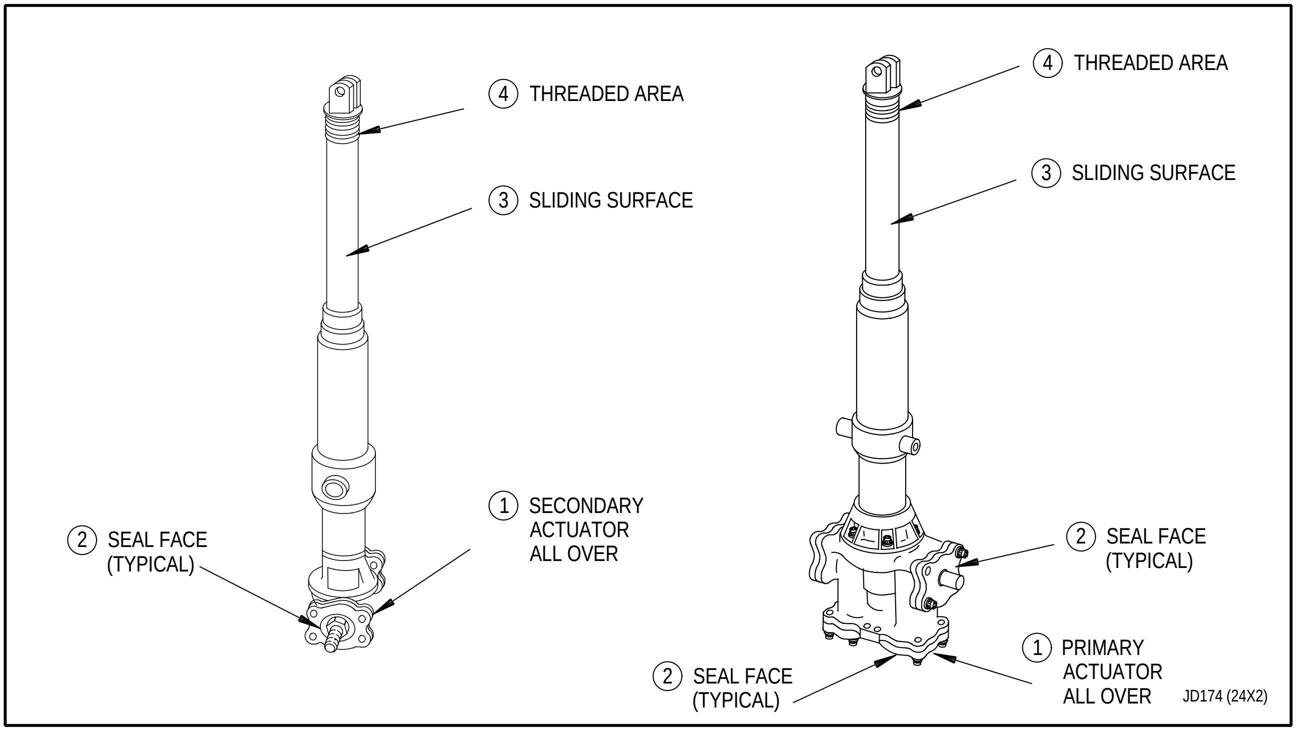
(2) If the actuator performs correctly, do the following:

(a) Fully extend the actuator. Remove ratchet.

CAUTION

Actuators can be damaged if torque exceeds 25 pound-inches after contacting internal stop.

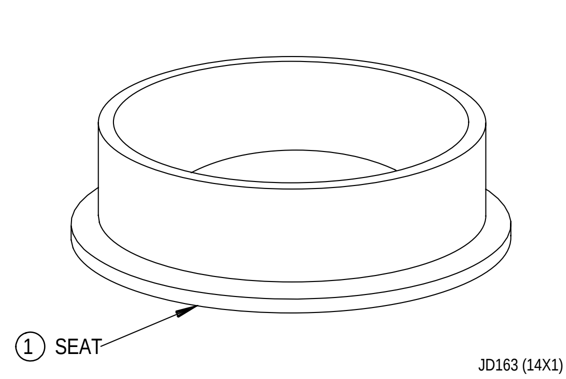
(b) Place square drive of torque wrench in square drive of each actuator. Apply 25 pound-inches torque in the extend direction. If actuator does not yield with 25 pound-inches applied against its extended stop, actuator is serviceable. If actuator yields, replace it.



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Primary and secondary actuator all over -			
Dents, cracks, excessive wear, corrosion	Not serviceable	Not reparable	Replace actuator.
2. Seal faces -			
Dents, cracks, excessive wear, corrosion	Not serviceable	Not reparable	Replace actuator.

Figure 6. Convergent Nozzle Primary and Secondary Ball Screw Actuators - Inspection

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
3. Sliding surface -			
Dents, cracks, excessive wear, corrosion	Not serviceable	Not reparable	Replace actuator.
4. Threaded area -			
Crossed, broken, or dented threads	Not serviceable	Not reparable	Replace actuator.



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Seat -			
Wear	0.020 inch deep	Not reparable	Replace seat.
Cracks	Not serviceable	Not reparable	Replace seat.

Figure 7. Spring Seat - Inspection

e. Inspect primary and secondary actuator driveshafts as follows:

CAUTION

- Do not mix transmission and ball screw assemblies. Fully retract actuator before beginning disassembly. Do not rotate ball screw during inspection of driveshafts. Damage to assembly can result.
- Keep ball screw assembly in a horizontal position during disassembly. Do not allow bearing ring assembly to fall free from thrust plate. Damage to assembly can result.

NOTE

Nozzle actuator driveshaft inspections are required for all actuators on an engine which has experienced damaged primary flexible shafts, nozzle actuator malfunction, or nozzle synchronizing ring fracture.

(1) Remove lockwire from four screws connecting transmission housing to outer tube assembly and remove connecting screws. (See figure 7A.)

(2) Separate transmission housing from outer tube assembly.

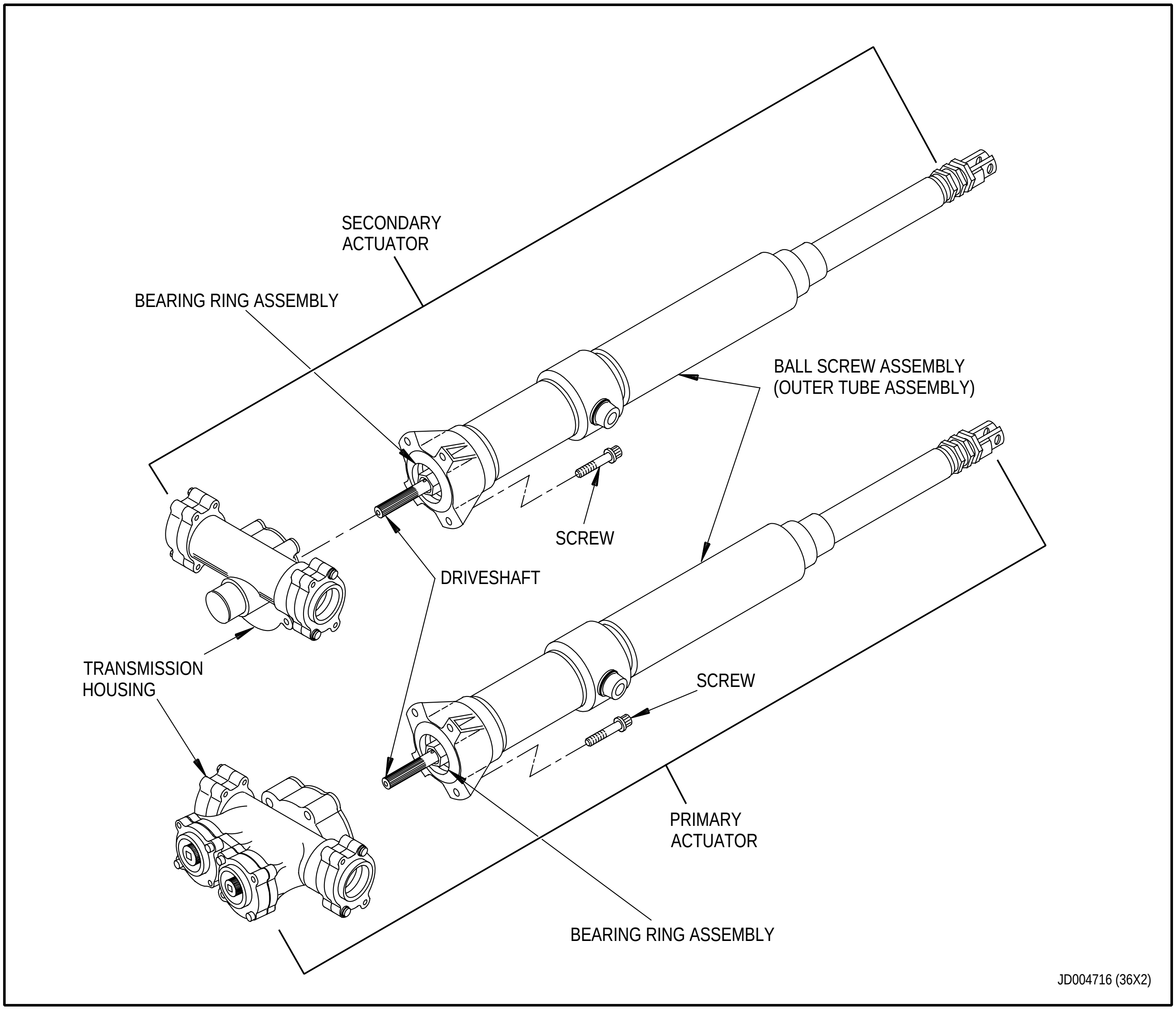


Figure 7A. Primary and Secondary Actuator Transmission Housings - Removal and Installation

(3) Remove and visually inspect driveshaft for twisting. (See figure 7B.)

(4) Replace driveshaft if any twisting is noted.

NOTE

If actuator driveshaft is sheared, actuator shall be returned for depot inspection.

(5) Replace actuator if driveshaft is sheared.

(6) Install spring pin in driveshaft before installing driveshaft into actuator.

(7) Assemble transmission housing and ball screw assembly using hand force only. There shall be no gap between transmission housing and ball screw assembly.

(8) Install screws and torque 40 to 45 pound-inches. Lockwire screws in pairs using PN MS9226-03 wire.

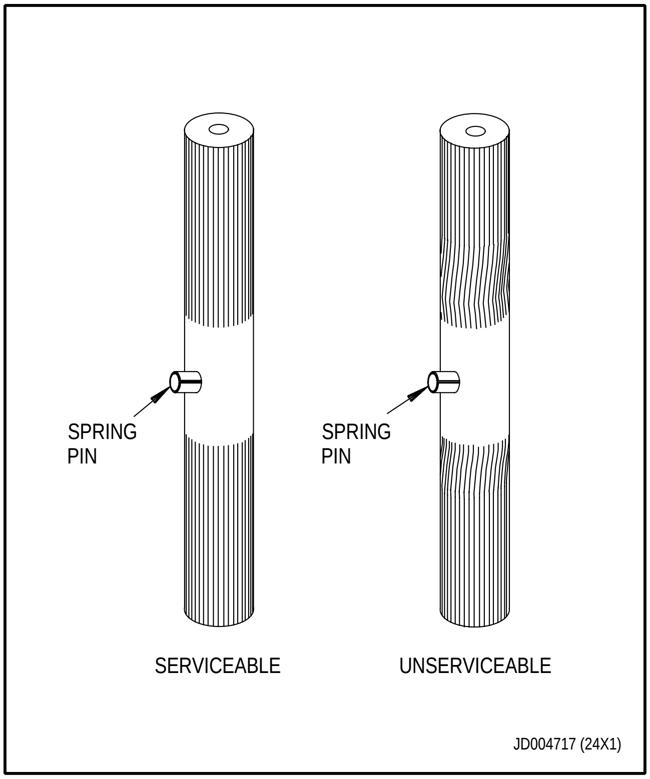


Figure 7B. Driveshaft Inspection

4A. CONVERGENT NOZZLE PRIMARY AND SECONDARY BALL SCREW ACTUATORS - LUBRICATION.
(See Figure 7C.)

NOTE

- This procedure may be performed with actuators installed on modules or engines or uninstalled on workbench.
- This procedure does not affect nozzle module rigging unless more than one acuator is removed from module or engine at the same time.

a. Locate primary and four secondary actuators.

b. Remove safety wire from both inboard transmission/drive section bolts. These are bolts closest to centerline of actuator.

c. Remove both inboard transmission/drive section bolts.

d. Install grease fitting into one of the two boltholes. Screw fitting into bolthole approximately halfway using fingers.

CAUTION

Use of other than specified lubricant may cause grease degredation and nozzle distress.

e. Use only 100% Braycote 602EF grease. Other greases, including alternate greases used on flexible shafts, are not permitted for use on actuators. Install grease gun onto grease fitting.

f. Pump Braycote 602EF grease into actuator until it starts to exit open bolthole. This may require 30 or more cycles.

g. Remove grease gun and fitting.

h. Install bolts and torque 40 to 45 pound-inches. Wipe away any excess grease from actuator housing and surrounding area.

i. Safety wire bolts together using MS9226-03 wire.

j. Repeat procedure for remaining actuators.

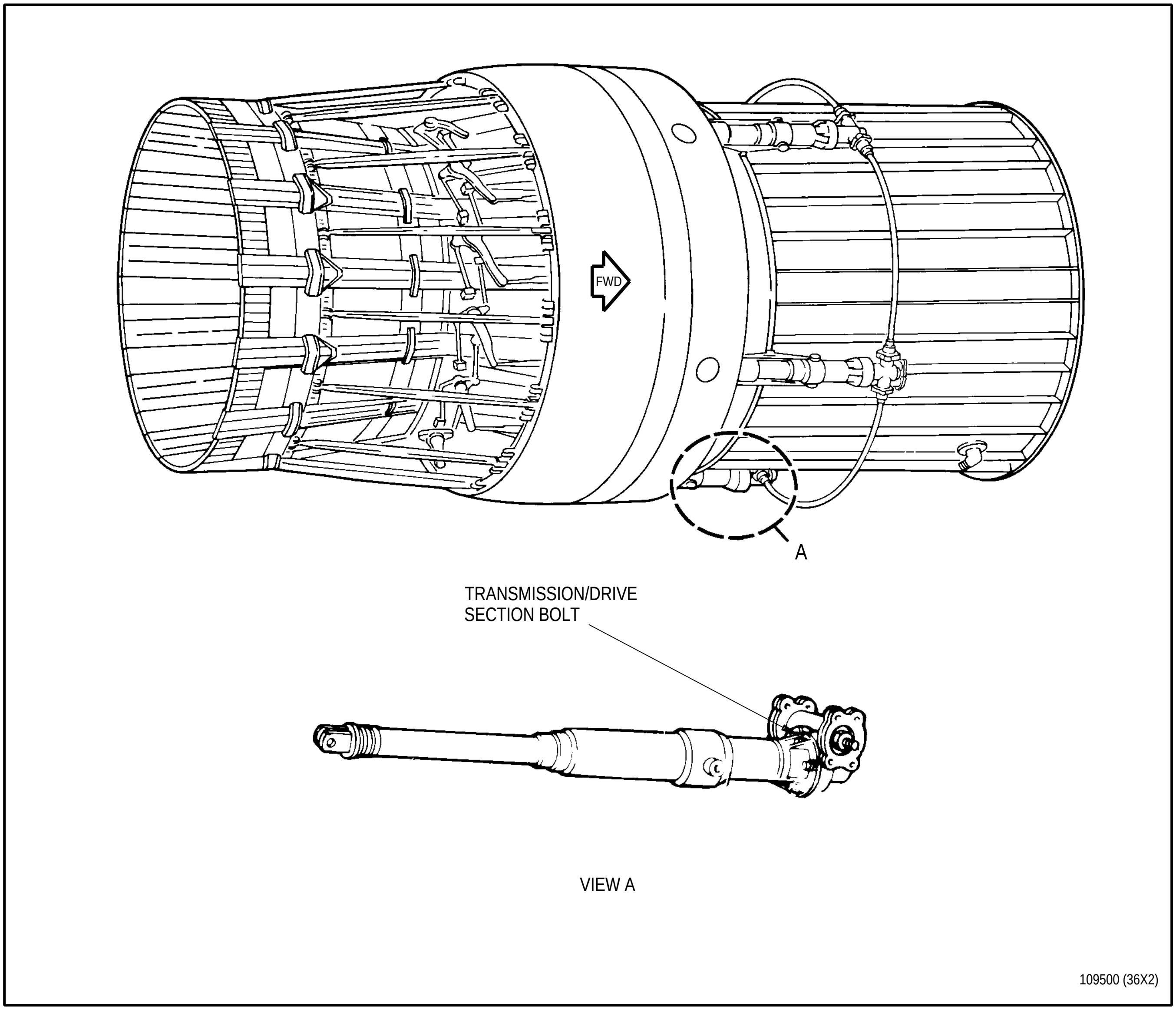


Figure 7C. Convergent Nozzle Primary And Secondary Ball Screw Actuators - Lubrication

5. CONVERGENT NOZZLE PRIMARY AND SECONDARY BALL SCREW ACTUATORS - INSTALLATION.
(See Figures 8 through 10.)

a. If the primary or secondary actuator being installed is a replacement actuator, adjust its clevis to proper length as follows:

(1) Using manual crank, turn input drive(11, figure 8) of actuator(3) until actuator is at its shortest length (contact is made with stop).

(2) Loosen hand knob(1) of PWA 51758 fixture(9), that was indexed to actuator which was removed. Ensure fixture is rigged to appropriate actuator being replaced. Remove pin(8) from fixture. (See figure 8.)

(3) Place actuator(3) in block(10) of fixture so bearings of actuator(3) line up with hole in block and hole in clamp(2).

(4) Slide clamp(2) toward actuator(3) until actuator is supported at bearings. Tighten hand knob(1) of block(10).

(5) Position clevis(5) of actuator(3) on adjustable block(6).

(6) If pin(8) cannot be inserted through clevis(5) and into hole in adjustable block(6), loosen actuator jamnut(4) and adjust clevis(5) as required until pin(8) can be inserted.

(7) With actuator(3) still in fixture(9) and pin(8) installed, torque jamnut(4) of actuator 425 to 475 pound-inches. Lockwire jamnut with PN MS9226-02 wire.

(8) Remove actuator(3) from fixture. Replace and tighten hand knob(1) and cap screws(7). Remove tag from fixture.

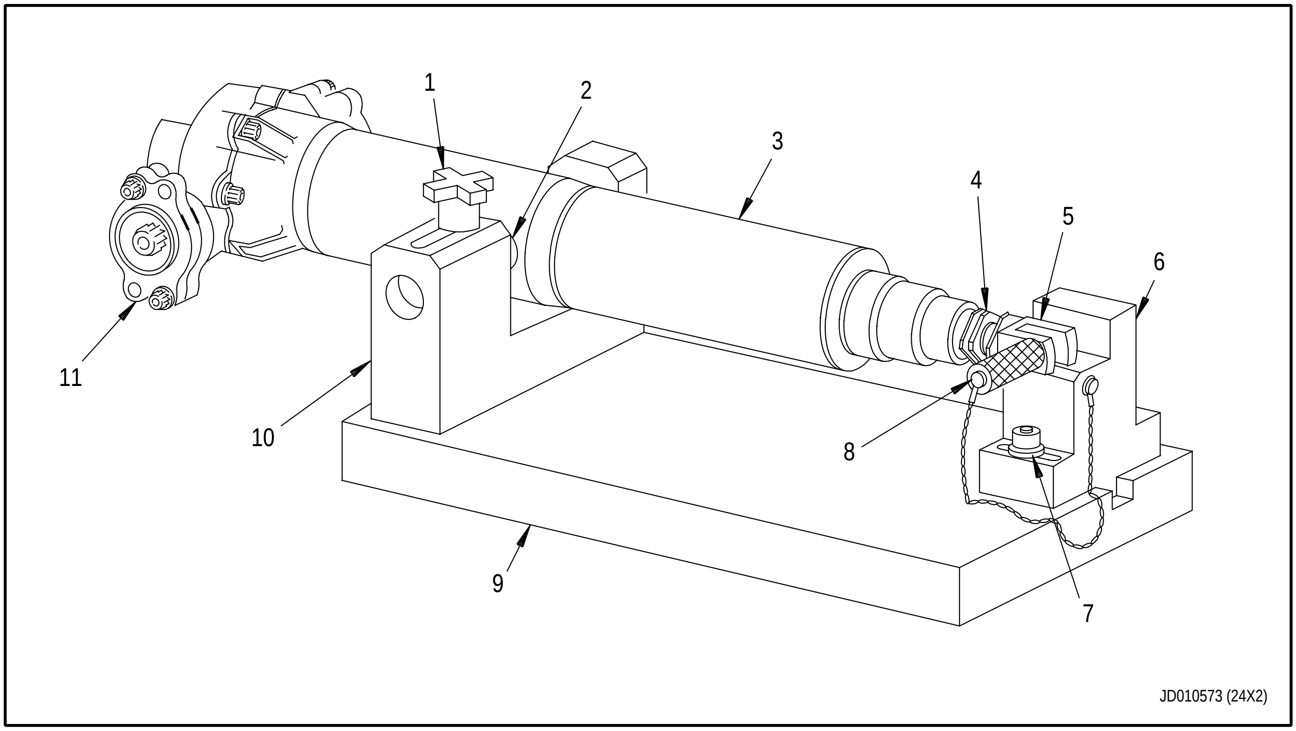
b. Install spring on actuator(9, figure 9, sheet 1) over clevis. Position spring seat(8), small end first, against spring(9) on actuator.

c. Put a light coat of PWA 36035 antigalling compound on threads of four support mounting bolt(4 and 6).

CAUTION

Use of substitute bolts, especially ones of greater length, can cause actuation system failure or damage to synchronizing connecting link guides inside nozzle assembly.

d. Position one support(10) on agumentor duct and install bolts(4), nuts(3), and bolts(6).



1. Hand knob
2. Clamp
3. Actuator
4. Actuator jamnut
5. Clevis
6. Adjustable block
7. Cap screws (two places)
8. Pin
9. PWA 51758 fixture
10. Block
11. Input drive

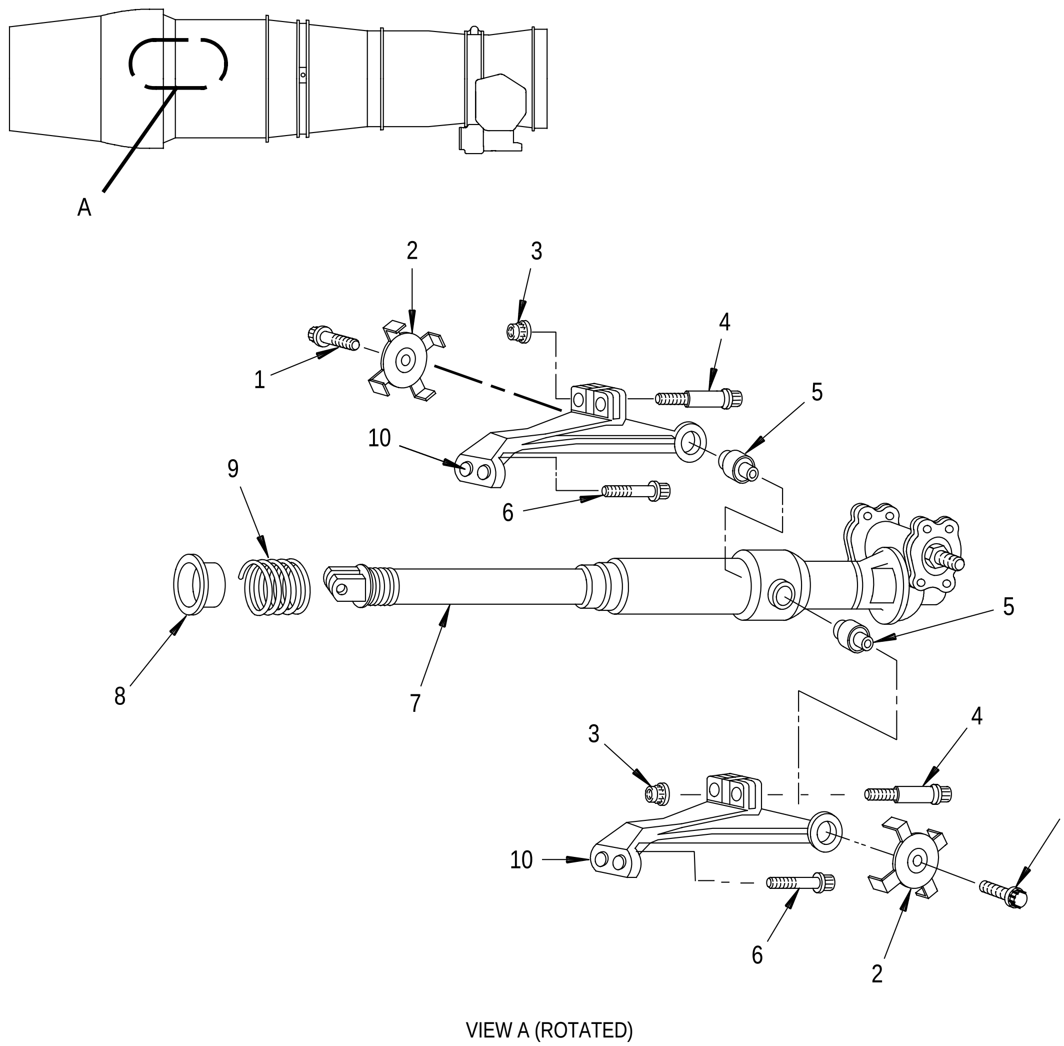
Figure 8. Indexing Replacement Convergent Nozzle Primary and Secondary

e. Position actuator(7) on augmentor duct and install dowels of actuator into bearings(5) of support(10).

f. Install remaining support(10) on actuator(7) and augmentor duct. Install bolts(4), nuts(3), and bolts(6).

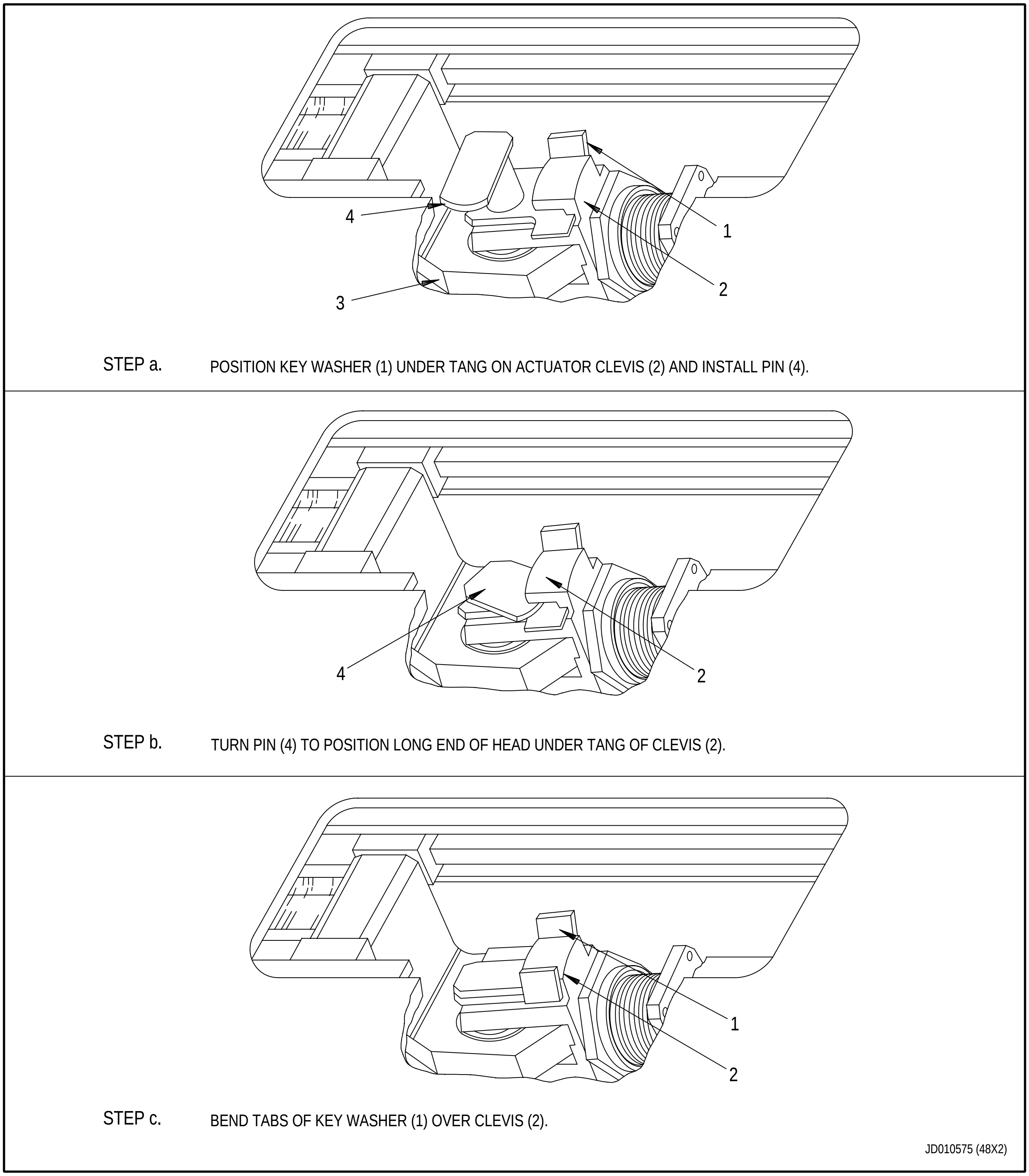
g. Torque nuts(3) 27 to 30 pound-inches. Torque bolts(6) 43 to 48 pound-inches.

h. Put a light coat of PWA 550 antigalling compound on threads of bolts(1) that attach supports(10) to actuator(7).



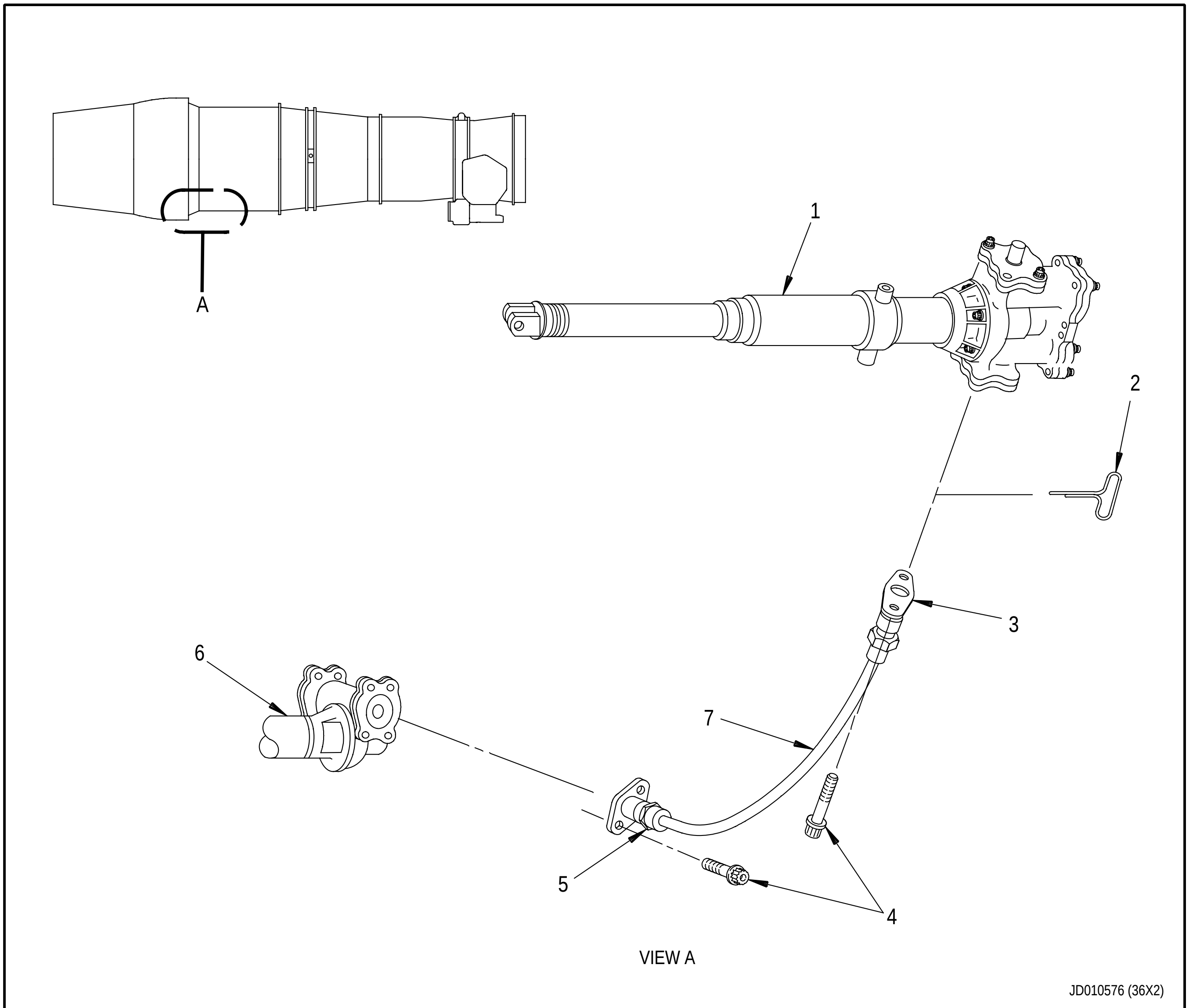
1. Bolt
2. PN 4052098 key washer
3. Nut
4. Bolt
5. Bearing
6. Bolt
7. Actuator
8. Spring seat
9. Spring
10. Support

Figure 9. Convergent Nozzle Primary and Secondary Ball Screw Actuators - Installation (Sheet 1 of 4)



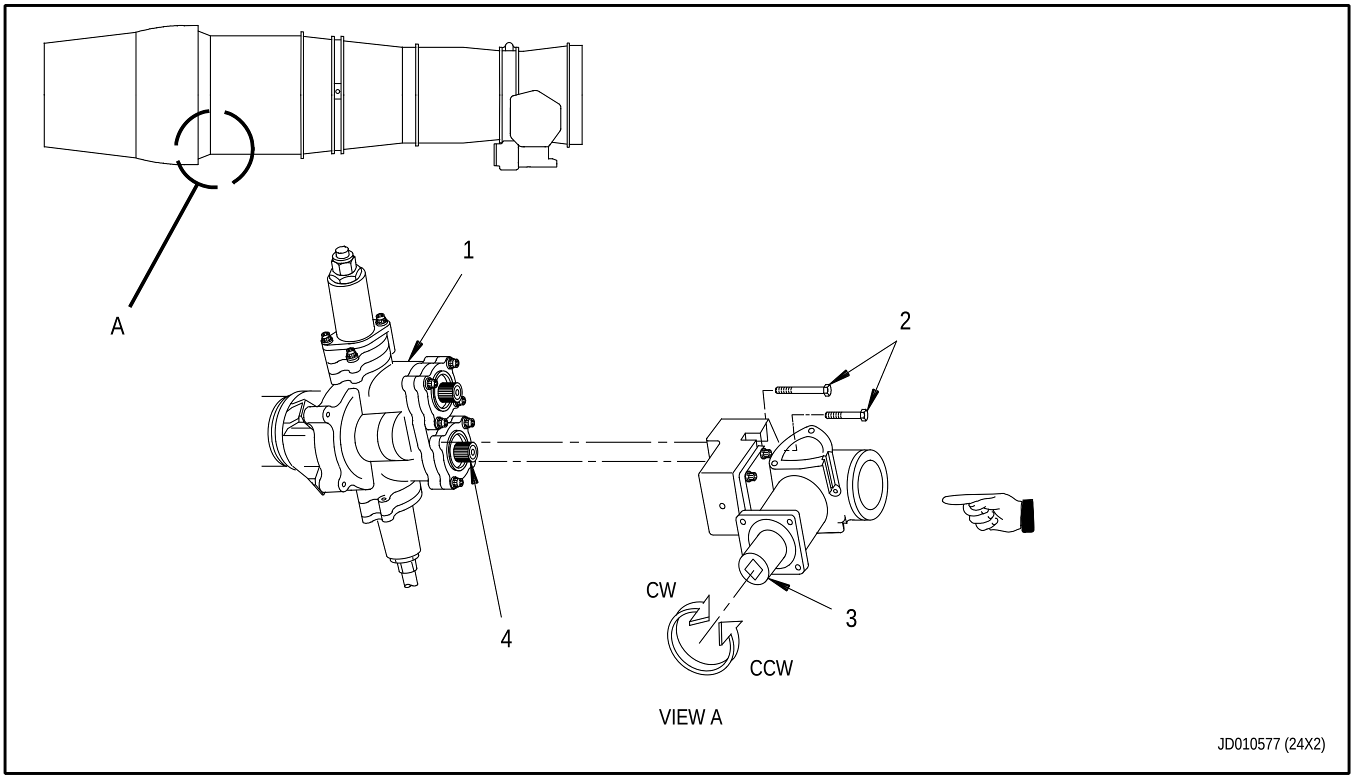
1. PN 4025416 key washer
2. Actuator clevis
3. Connecting Link
4. Clevis pin

Figure 9. Convergent Nozzle Primary and Secondary Ball Screw Actuators - Installation (Sheet 2 of 4)



1. Primary actuator
2. PN MS9245-28 cotter pin
3. Adapter
4. Bolt
5. Jamnut
6. Secondary actuator
7. Secondary actuator shaft

Figure 9. Convergent Nozzle Primary and Secondary Ball Screw Actuators - Installation (Sheet 3 of 4)



1. Convergent nozzle primmary ballscrew actuator
2. Detail bolts
3. PWA 51757 wrench
4. Wingnut
5. Counter
6. Square drive adapter
7. Left hand feedback drive input shaft.

Figure 9. Convergent Nozzle Primary and Secondary Ball Screw Actuators - Installation (Sheet 4 of 4)

i. Install key washers(2) and bolts(1) to secure supports(10) to actuators(7). Torque bolts 23 to 36 pound-inches. Lockwire bolts to key washers with PN MS9226-04 wire.

j. Install standard manual crank (ratchet or speed handle) on square drive on side of shaft of actuator(7). Extend actuator until hole in clevis (2, figure 9, sheet 2) of actuator is aligned with hole in connecting link(3).

k. Put a light coat of PWA 36545 antigalling compound on clevis pin(4).

l. Fasten a length of wire around clevis pin(4) and key washer(1).

Hold wire and install key washer(1) and clevis pin(4).

m. Install convergent nozzle secondary actuator flexible shafts as follows: (See figure 9, Sheet 3.)

(1) Slide jamnuts(5) and tube adapters(3) back over shaft assembly(7).

(2) Insert inner square drive of shaft(7) into square drive on side of primary actuator(1). Do not rotate actuator square drive.

(3) Align rigid coupling splines on other end of shaft(7) with splines on secondary actuator(6). Do not rotate splines of actuator.

(4) Align cotter pin holes in splines and coupling. Slide coupling over actuator splines.

(5) Install T-shapped cotter pin(2) and bend ends around coupling.

(6) Position adapters(3) against actuators(1 and 6).

(7) Apply PWA 36035 antigalling compound to threads of bolts(4). Install bolts, and torque 12 to 16 pound-inches. Lockwire bolts with PN MS9226-04 wire.

(8) Install jamnut(5) over bushing at each adapter(3). Hold hex on bushing and torque jamnut 120 to 125 pound-inches. Lockwire jamnut to bolts securing tube adapters with PN MS9226-02 wire.

(9) Repeat step m. (1) through (8) to install shaft on other side of actuator.

CAUTION

Failure to remove PWA 57701 rigging pin set before moving augmentor nozzle will cause extensive damage.

n. Remove PWA 57701 rigging pin set.

o. Check operation of actuators as follows: (See figure 9, Sheet 4.)

NOTE

PWA 56639 adapter may be substituted for PWA 51757 torque adapter, but only if a second person assists in counting and recording number of full travel turns from hard stop to hard stop.

(1) Install PWA 51757 torque adapter(3) on left-hand feedback drive input shaft(7) of primary actuator(1). Install bolt details(2) and torque 14 pound-inches.

(2) Install manual crank, ratchet, speed handle, air gun, or equivalent into square drive adapter(6).

CAUTION

Applying excesive torque after contact with internal stop, may cause damage to actuator.

(3) Turn square drive or adapter(6) counterclockwise to close nozzle against actuator extended stop. Do not apply excessive torque after contact with stop is made.

(4) Set counter to zero with set screw.

(5) Turn square drive adapter(6) clockwise until augmentor nozzle assembly is fully open (actuators against retracted stop).

(6) Record number on counter. Set counter to zero with wing nut.

(7) Turn square drive adapter(6) counterclockwise to close nozzle (actuators against extended stops). Record number on counter and remove wrench.

(8) If number on wrench counter in step o. (6) and (7) was 340 to 342, actuators operate properly. Proceed to step p.

(9) If number on wrench counter in step o. (6) and (7) was not within limits of 340 to 342, resize augmentor nozzle assembly. Refer to T.O. 2J-F100-53-10, WP 702 00.

p. Install convergent nozzle flexible primary actuator shafts to convergent nozzle primary actuator as follows:

(1) Slide jamnuts(3, figure 10) and adapters(6) back over primary actuator flexible shafts(4).

(2) Insert inner square drive end of primary actuator flexible shaft(4) into square drive on back of primary actuator(10).

(3) Align cotter pin hole and splines of rigid coupling on end of primary actuator flexible shaft(4) with cotter pin hole and splines on back of primary actuator(10).

(4) Install PN MS9245-28 cotter pin(1) through holes in rigid coupling and splines. Bend ends of cotter pin around rigid coupling.

(5) Position adapter(6) against primary actuator(10).

(6) Apply PWA 36035 antigalling compound to threads of bolts(5).

(7) Install bolts(5) to secure adapter(6). Torque bolts 13 to 16 pound-inches.

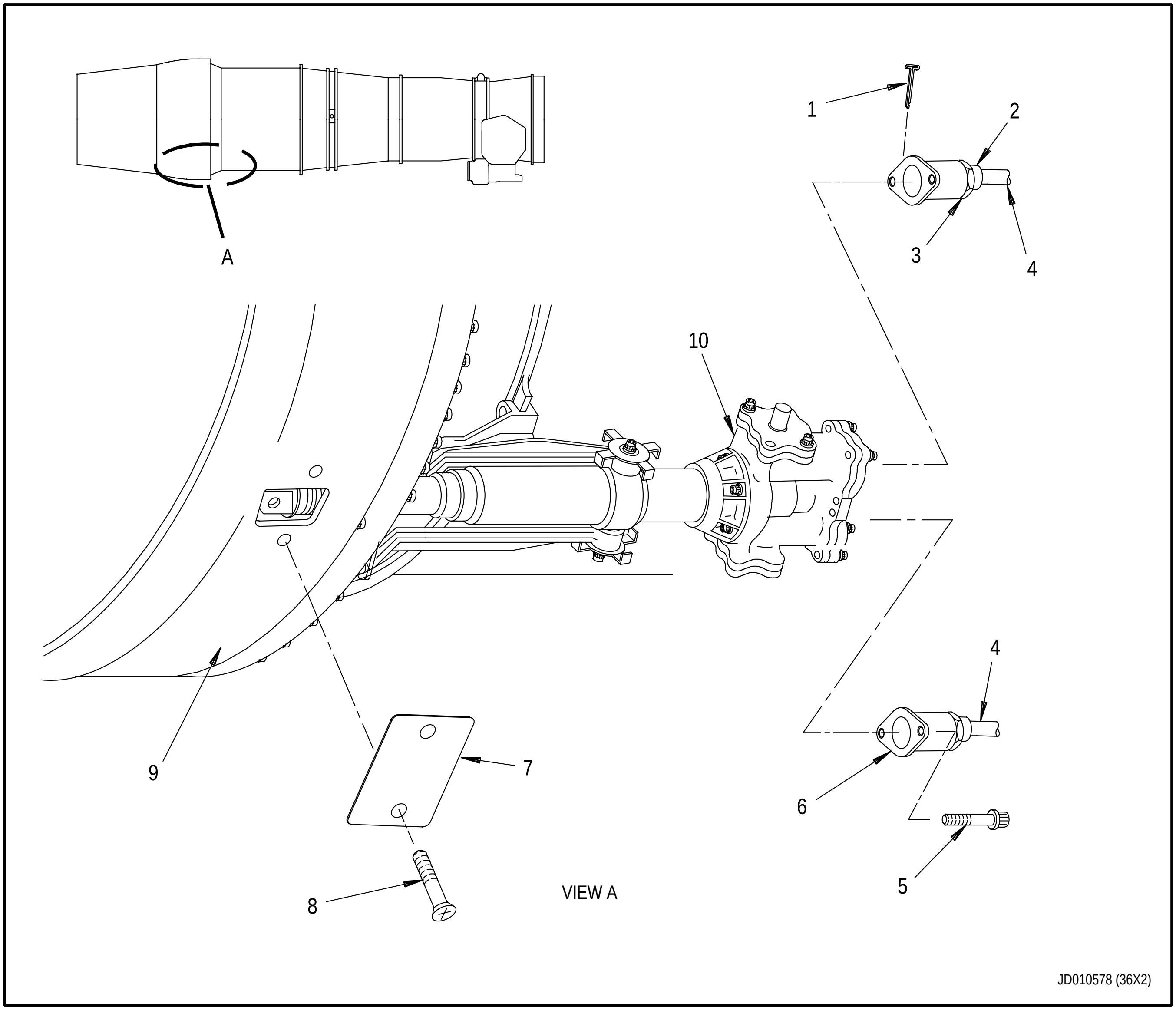
(8) Lockwire bolts(5) using PN MS9226-02 wire.

(9) Install jamnut(3) over bushing(2) on adapter(6). Hold hex on bushing and torque jamnut(3) 120 to 125 pound-inches.

(10) Lockwire jamnut(3) to bolts(5) using PN MS9226-02 wire.

q. Put a light coat of PWA 36035 antigalling compound on threads of access cover mounting screws(8).

r. Install access cover(7) on nozzle support with screws. Torque screws 32 to 36 pound-inches.



1. PN MS9245-28 cotter pin
2. Bushing
3. Jamnut
4. Primary actuator flexible shaft
5. Bolt
6. Adapter
7. Access cover
8. Screw
9. Nozzle support
10. Primary actuator

Figure 10. Primary Actuator Shafts and Access Cover Installation

WORK PACKAGE

TECHNICAL PROCEDURES

CONTROL - EXHAUST NOZZLE, CONVERGENT

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 32

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	2	4 - 9	0	27	2
2	0	10	2	28 - 31	0
3	2	11 - 26	0	32 Blank	0

REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information	T.O. 2J-F100-53-1
General Procedures	WP 021 00
Hydraulic Pressure Tester PWA 50096	T.O. 33D4-6-617-1
Convergent Exhaust Nozzle Control	T.O. 6J3-8-21-4

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Alcohol, denatured or	O-E-760, Type III
Trichloroethane inhibitor-1,1,1	O-T-620
Barrier, material	MIL-B-121, Type II
Cloth, lint-free	-
Compound, antigalling (PWA 550)	Hi-T-650 or Lubri-Bond HT
Lockwire (0.020 inch diameter)	MS9226-02
Lockwire (0.032 inch diameter)	MS9226-04
Oil, engine	MIL-L-6081, Grade 1010
Oil, lubricating	MIL-L-7808 or
Petrolatum	VV-P-236
Paper, Ph neutral	MIL-P-17667
Solvent, Petrolatum	P-D-680, Type II

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Gasket, angle	2155326	1
Packing	MS2950-06	1
Packing	MS9966-04	2
Packing	MS9966-06	2
Pin, cotter	MS9245-23	1

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures for the convergent exhaust nozzle control:

- Removal
- Removal of attaching parts
- Cleaning
- Inspection
- Installation of attaching parts
- Installation
- Convergent exhaust nozzle control pneumatic drive assembly (air motor) - Replacement
- Convergent exhaust nozzle control electro-hydraulic servo valve - Replacement
- Leak check
- Follow-on maintenance
- Storage and shipment

2. CONVERGENT EXHAUST NOZZLE CONTROL - REMOVAL. (See Figure 1.)

a. Loosen coupling nuts holding right and left convergent nozzle primary actuator flexible shafts to rear of convergent exhaust nozzle control. Slide coupling onto shafts and disconnect shafts from control. (See figure 1, Sheet 1.)

b. Disconnect electrical cable connectors P92 from control, P7 from exhaust nozzle position transmitter, and P91 from control. Install protective closures.

c. Loosen coupling nut on convergent exhaust nozzle control air supply tube until coupling lock can be disengaged. Do not loosen nut past cotter pin. Spread coupling, and slide it back on tube.

d. Disconnect air supply tube from rear of control. Remove and discard angle gasket.

e. Loosen tube nuts holding fuel drain tube, PF1, PFS1, and PFMO tubes. Disconnect tubes. Install protective closures.

f. Support control and remove nut, spacers, and bolt holding rear of control to left rear lug on Flange K. (See figure 1, Sheet 2.)

g. Remove nut, bearing, and bolt holding control to right rear link on Flange K bracket. Remove bearing from link.

h. Move control downward and forward to clear left rear lug, right rear link, and flex shafts.

i. Remove nut, bushings, bearing, and bolt holding front of control to engine bracket.

j. Remove control.

k. Purge fuel from exhaust nozzle control.

l. Place protective covers over tube openings of control.

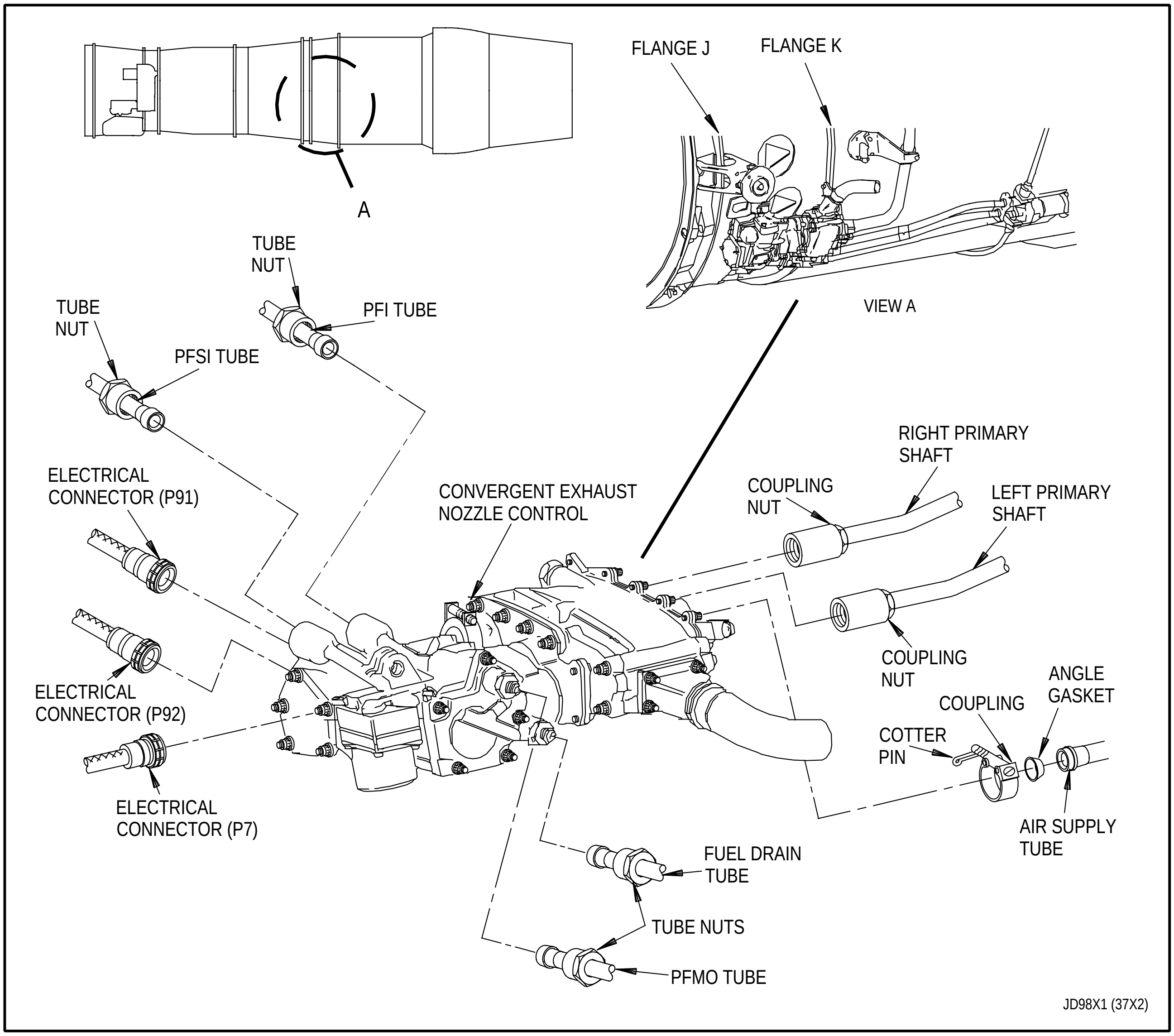


Figure 1. Convergent Exhaust Nozzle Control - Removal (Sheet 1 of 2)

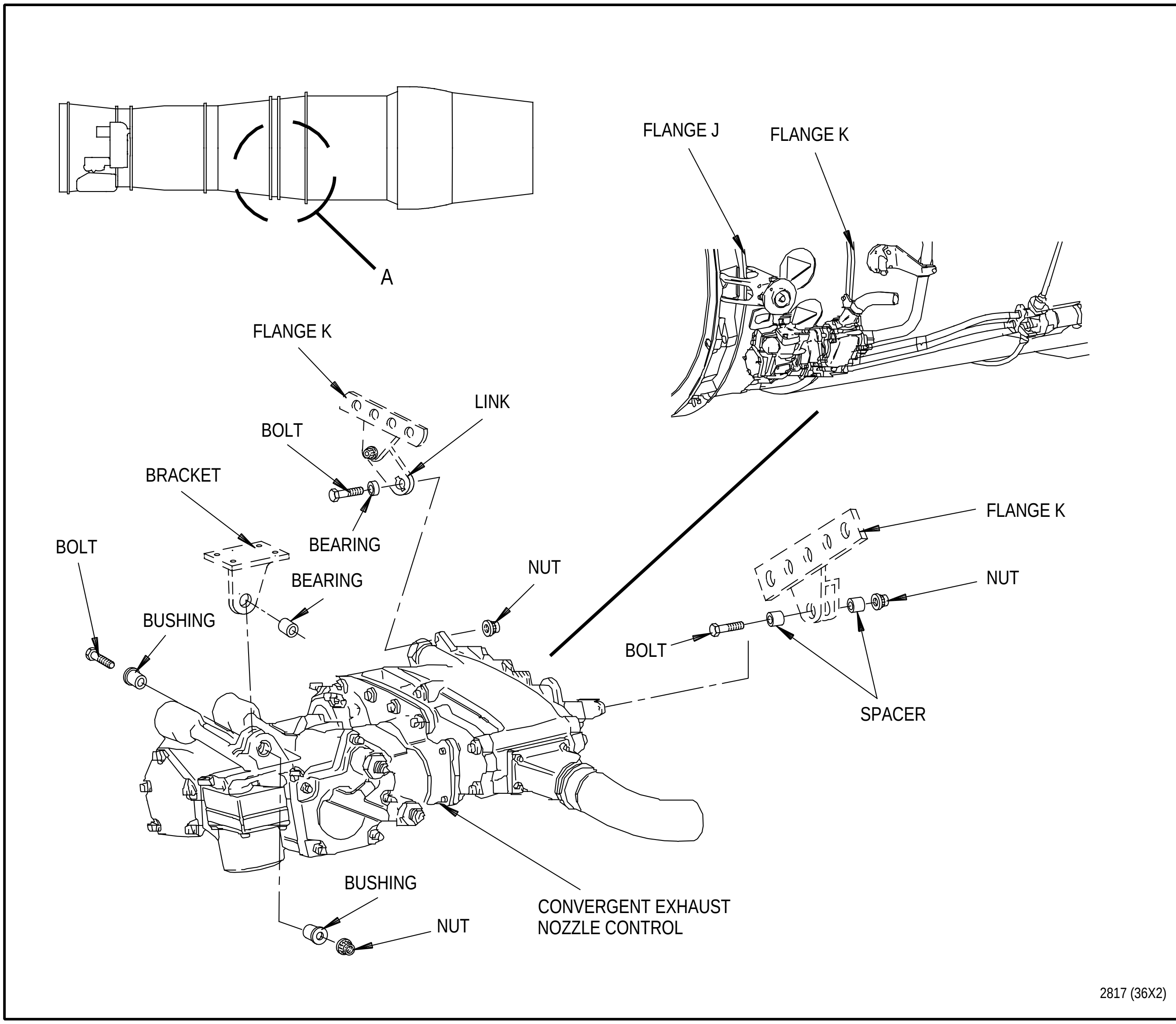


Figure 1. Convergent Exhaust Nozzle Control - Removal (Sheet 2 of 2)

3. CONVERGENT EXHAUST NOZZLE CONTROL - REMOVAL OF ATTACHING PARTS. (See Figures 2 and 3.)

a. Remove bolts holding convergent exhaust nozzle control air vent tube to control. Remove vent tube.

b. Remove adapters and packings from ports marked PF1, PFS1, PD, and PFMO. Discard packings. (See figure 2.)

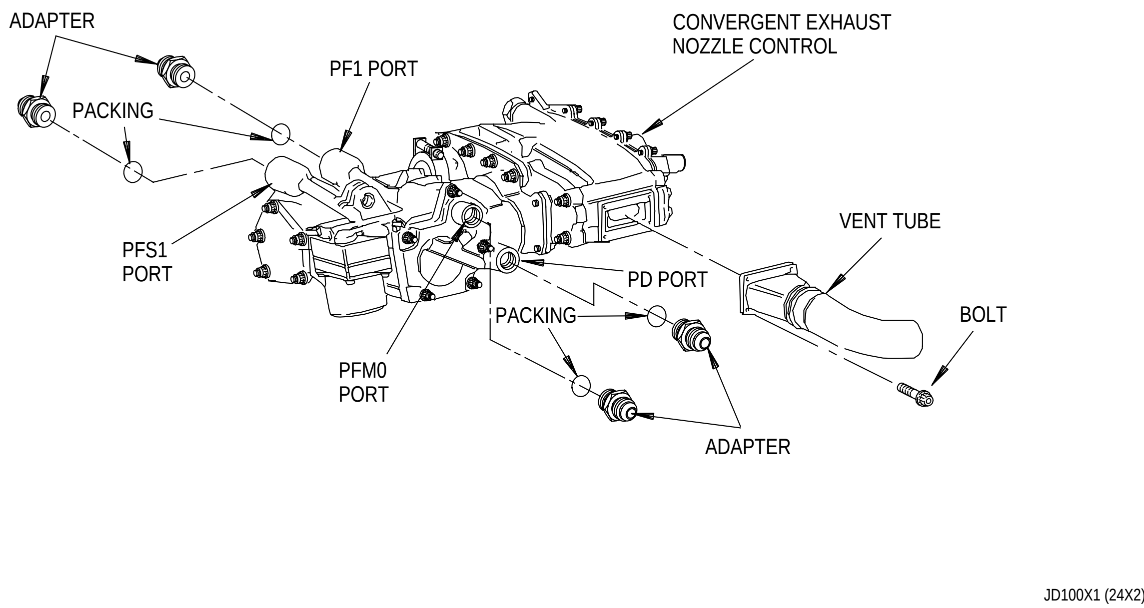


Figure 2. Convergent Exhaust Nozzle Control - Removal of Attaching Parts

NOTE

Do not remove nozzle position transmitter from control unless necessary for inspection or replacement of transmitter or control.

c. Remove nozzle position transmitter as follows: (See figure 3.)

(1) Disconnect and cap J7 electrical cable, if installed on engine.

(2) Remove bolt and nut from clamp.

(3) Rotate clamp so cutout in rear of clamp is between the two scallop cuts in transmitter flange.

(4) Spread clamp until entire transmitter flange is free. Remove transmitter. Do not remove clamp from control flange.

(5) Install protective closure in clamp.

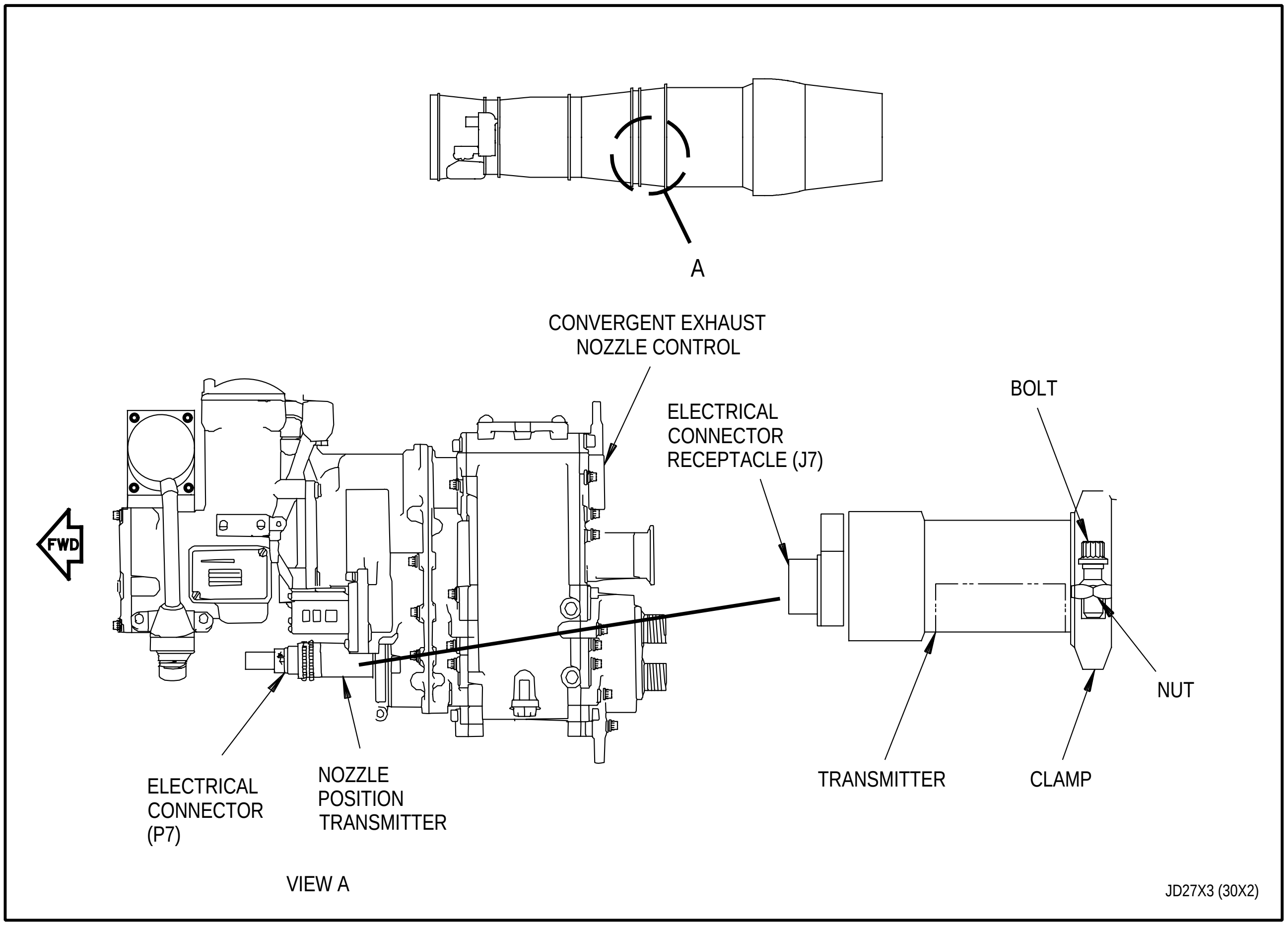


Figure 3. Nozzle Position Transmitter - Removal

4. CONVERGENT EXHAUST NOZZLE CONTROL - CLEANING.

a. Wipe exterior of convergent exhaust nozzle control, nozzle position transmitter, and convergent exhaust nozzle control air vent tube with cloth moistened with P-D-680, Type II petroleum solvent.

b. Wipe control and vent tube dry with clean, dry lint-free cloth.

c. Remove protective closure from electrical connector P7 on transmitter. Clean connector pins, socket, and cable insulation with denatured alcohol O-E-760, Type III, or Trichloroethane inhibitor-1,1,1 O-T-620.

d. Let electrical connector air-dry or dry connectors with clean, compressed air at less than 30 psig. Replace protective closure on connector.

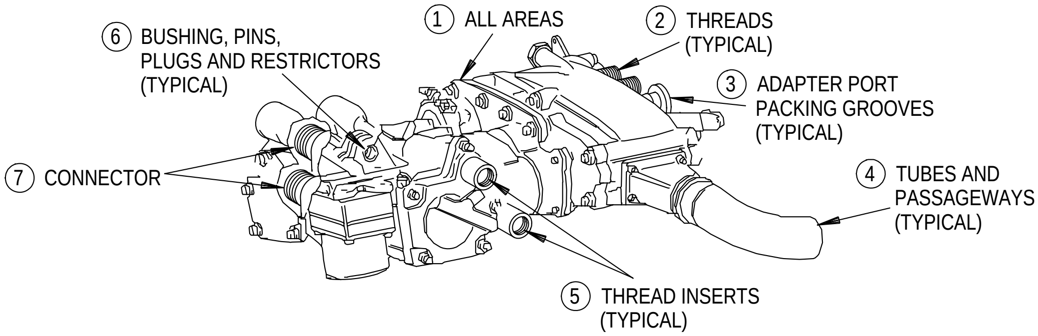
5. CONVERGENT EXHAUST NOZZLE CONTROL - INSPECTION.
(See Figures 4 and 5.)

NOTE

The CENC rotor may bind when one air motor drive is rotated during CENC inspection. This binding is normal if rotating the other air motor in the opposite direction eliminates the binding.

a. Visually inspect convergent exhaust nozzle control. (See figure 4.)

b. Inspect electrical connectors for bent pins. Refer to T.O. 2J-F100-53-1, WP 021 00.



Inspection Area Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. All areas -			
Wear, corrosion, cracks, dents, or signs of leakage	Not serviceable	Not reparable	Replace control.
2. Threads -			
Damage	Not serviceable	Any amount of minor damage	Minor thread damage may be repaired using thread die or fine stone.
3. Adapter port packing grooves -			
Roughness or wear	Not serviceable	Any amount of minor damage	Smooth rough edges or burrs.

Figure 4. Convergent Exhaust Nozzle Control - Inspection

Legend for figure 4 (continued)

Inspection Area Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
4. Tubes and passageways -			
Obstructions	Not serviceable	Not reparable	Replace control.
5. Thread inserts -			
Looseness	Not serviceable	Not reparable	Replace inserts.
6. Bushings, plugs, pins, restrictors -			
Worn, loose, or damaged	Not serviceable	Not reparable	Replace worn, loose, or damaged parts.
7. Electrical connector receptacles J91 and J92 -			
Threads broken or dented	Not serviceable	Not reparable	Replace control (J91) or replace EHSV (J92).
Socket pins broken, missing, or cracked	Not serviceable	Not reparable	Replace control (J91) or replace EHSV (J92).

c. Ensure identification plate is securely attached. (See figure 5.)

d. Remove protective closure from electrical connector P7. Inspect connector sockets and cable insulation for damage. Replace cable, if cable or connector is damaged.

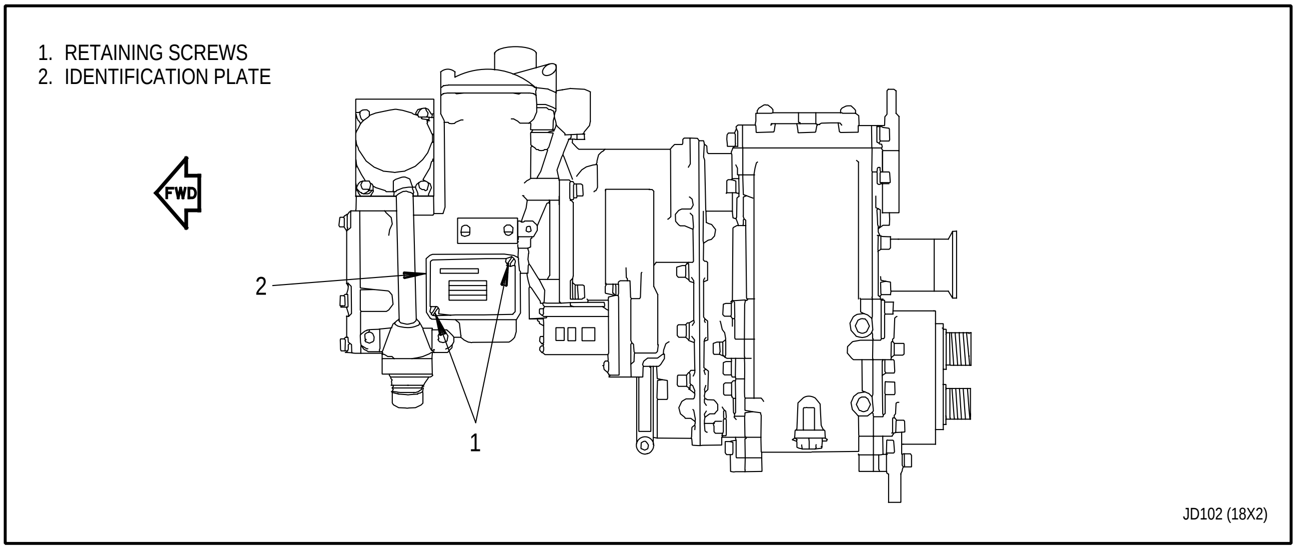


Figure 5. Convergent Exhaust Nozzle Control Identification Plate Mounting

6. CONVERGENT EXHAUST NOZZLE CONTROL - INSTALLATION OF ATTACHING PARTS.
(See Figures 6 and 7.)

a. If required, remove corrosion preventive compound from control. Refer to paragraph 4.

b. Lubricate two PN MS9966-04 packings and ends of two adapters that mate with control at PD and PFMO ports with a light coat of MIL-L-7808 oil or VV-P-236 petrolatum. Install packings and adapters in control. Torque adapters 65 to 75 pound-inches.

c. Lubricate two PN MS9966-06 packings and ends of two adapters that mate with control at PFS1 and PF1 ports with a light coat of MIL-L-7808 oil or VV-P-236 petrolatum. Install packings and adapters in control. Torque adapters 110 to 120 pound-inches.

d. Put a light coat of PWA 550 antigalling compound on threads of bolts used to hold vent tube to control.

e. Position vent tube on left side of control and install bolts. Torque bolts 24 to 36 pound-inches. Lockwire bolts with PN MS9226-04 wire.

f. Install transmitter on control as follows: (See figure 7.)

(1) Align slot in transmitter flange with pin in control flange.

(2) Rotate clamp so cutout in rear of clamp is between two scallop cuts in transmitter flange.

(3) Spread clamp and insert transmitter flange in clamp against control flange. Ensure aligning slot and pin are engaged.

(4) Rotate clamp so cutout aligns with a scallop cut in transmitter flange.

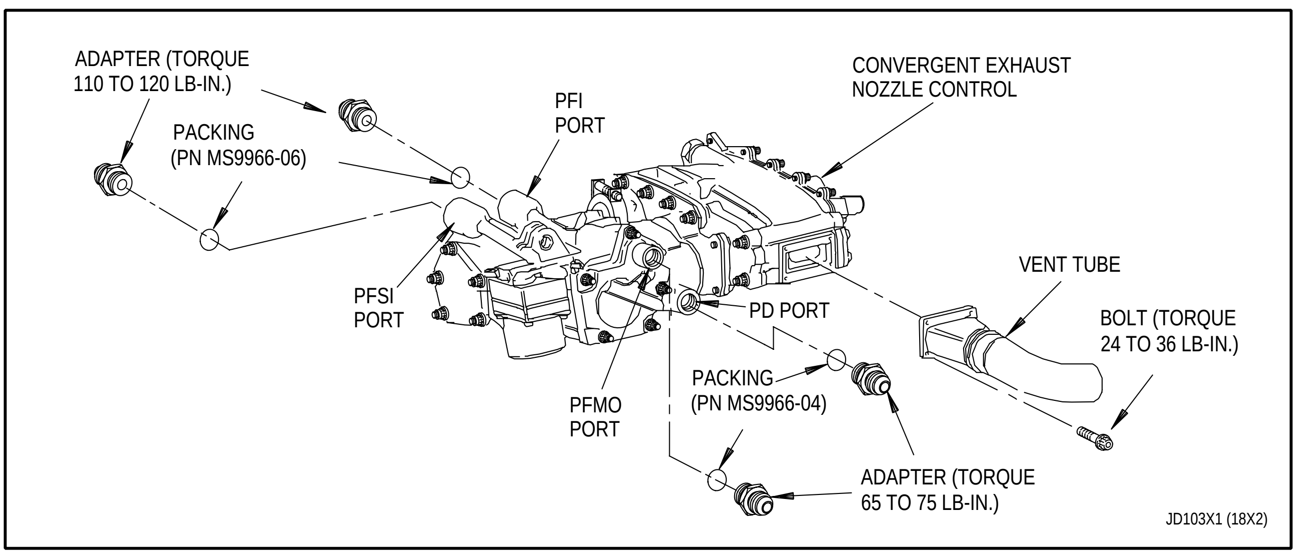


Figure 6. Convergent Exhaust Nozzle Control - Installation of Attaching Parts

(5) Secure clamp on flanges with bolt and nut. Torque nut 10 to 15 pound-inches. Lockwire clamp bolt with PN MS9226-04 wire.

(6) Lockwire clamp bolt as follows:

(a) For transmitter with covered index, use PN MS9226-02 wire.

(b) For transmitter with index on front face, use PN MS9226-04 wire.

(7) For transmitter with covered index, install cover. Torque mounting screws 10 to 12 ounce-inches. Install PN MS9226-02 wire.

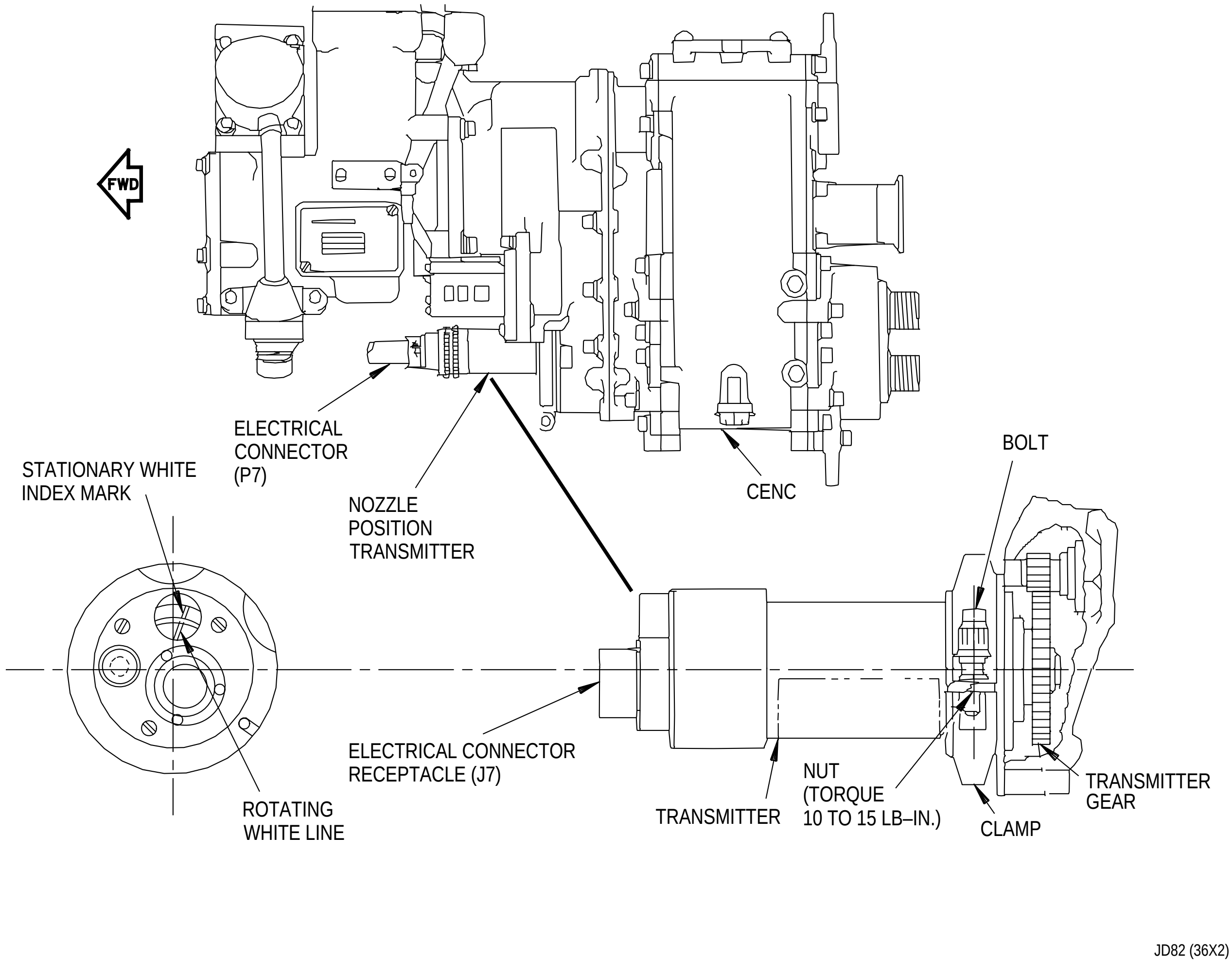


Figure 7. Convergent Exhaust Nozzle Control - Installation of Attaching Parts

7. CONVERGENT EXHAUST NOZZLE CONTROL - INSTALLATION.
(See Figures 8 and 9.)

a. Inspect mounting brackets for damage.

b. Put a light coat of PWA 550 antigalling compound on bearings to be installed in right mounting link on Flange K. Install bearings in link and bracket. (See figure 8, on Sheet 1.)

c. Put a light coat of PWA 550 antigalling compound on threads of three control mounting bolts.

d. Position control on lower fan duct, aligning mounting lugs with brackets. Do not engage primary flex shafts into control at this time. Ensure lug is located on rear side of link.

e. Install mounting bolts as follows:

(1) Install bushings, bolt, and nut fingertight at forward lug.

(2) Install bolt, spacers, and nut fingertight at left rear lug.

(3) Install bolt and nut fingertight at right rear lug.

(4) Torque nuts 27 to 30 pound-inches.

f. Remove protective closures from fuel drain tube, PFMO tube, PF1 tube, PFS1 tube, and air supply tube of control. (See figure 8, Sheet 2.)

g. Apply a light coat of PWA 550 antigalling compound to threads of tube nuts. Remove excess.

h. Connect fuel drain, PFMO, PF1, and PFS1 tubes to control. Torque tube nuts.

i. Place PN 2155326 angle gasket, small end first, in air supply tube. Place tube end against rear port at control.

j. Spread and slide clamp in place over mating flanges of air supply tube and rear port of control with swivel bolt pointing outboard.

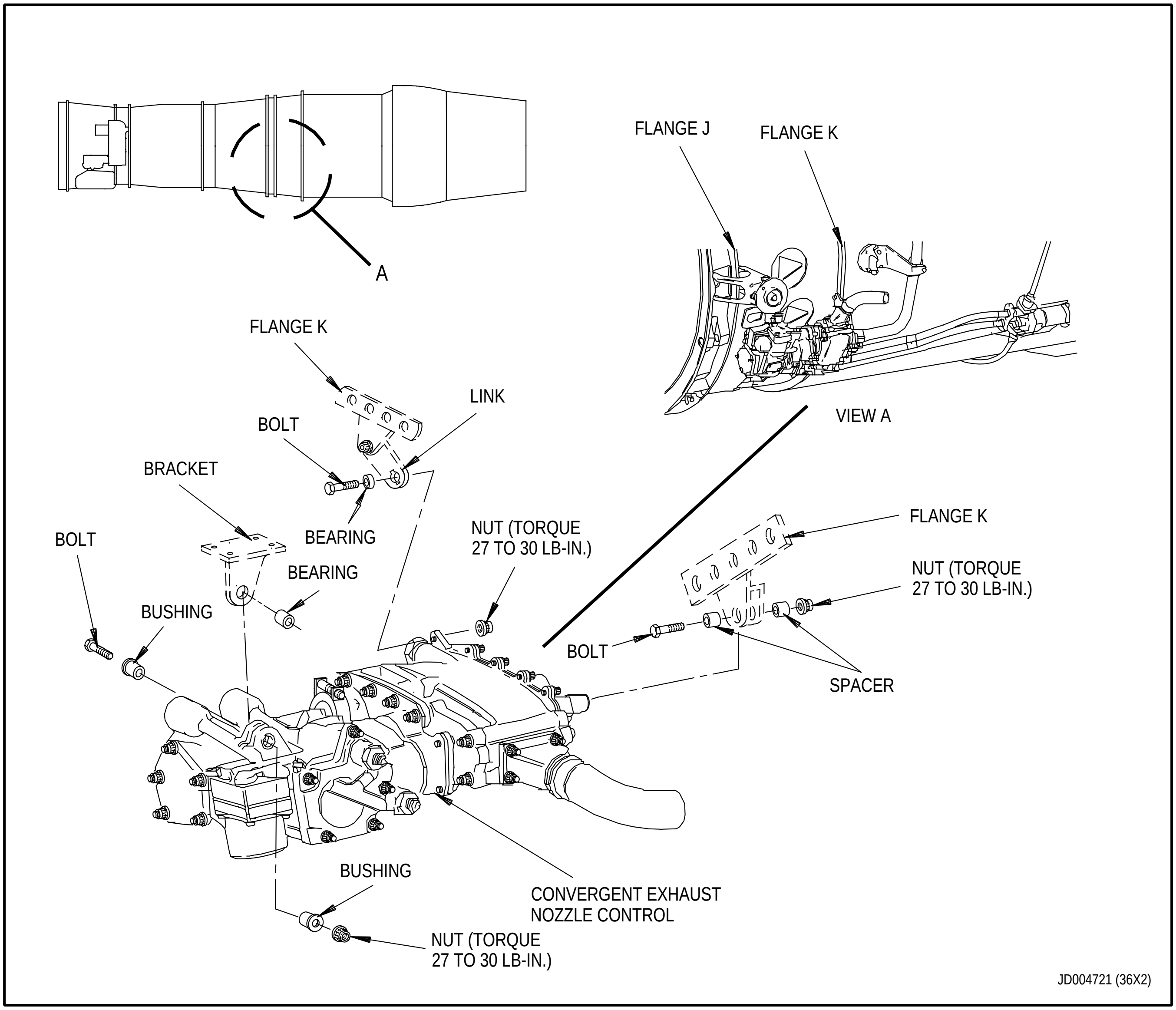


Figure 8. Convergent Exhaust Nozzle Control - Installation (Sheet 1 of 2)

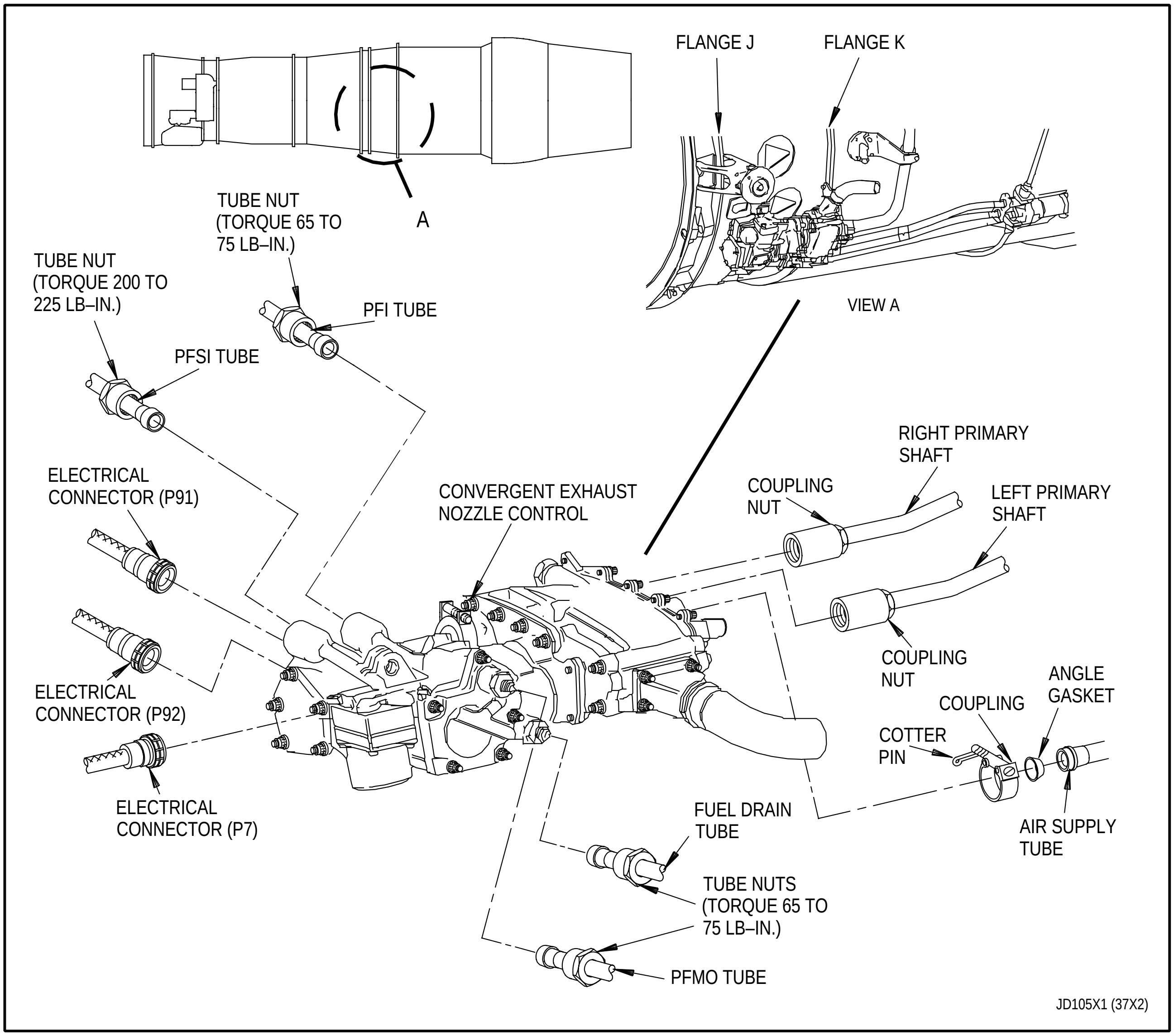


Figure 8. Convergent Exhaust Nozzle Control - Installation (Sheet 2 of 2)

k. Torque nut 30 to 50 pound-inches. Lockwire clamp with PN MS9226-04 lockwire. (See figure 9.)

l. If cotter pin was removed from clamp bolt, install PN MS9245-23 cotter pin in bolt.

m. Connect electrical connectors P91, P7, and P92 to receptacles on control as follows:

   (1) Align keyways and handtighten connector.

   (2) Ensure red line on receptacle is not visible when viewed at right angles.

   (3) Tighten connector firmly with soft-jawed pliers.

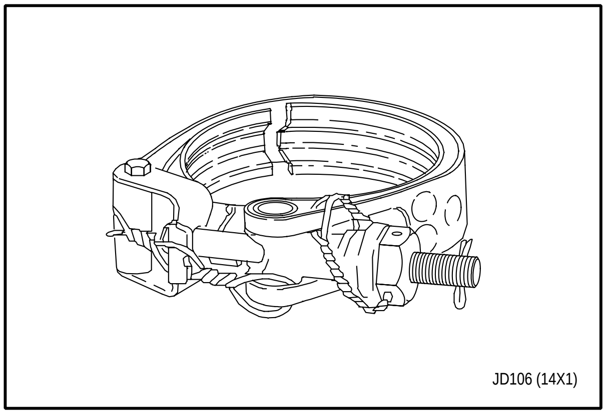


Figure 9. Clamp Lockwiring

8. CONVERGENT EXHAUST NOZZLE CONTROL PNEUMATIC DRIVE ASSEMBLY (AIR MOTOR) - REPLACEMENT.

(See Figure 10.)

NOTE

Convergent nozzle control shall be removed from engine prior to replacement of air motor.

a. Remove convergent exhaust nozzle control from engine. (Refer to paragraph 2.)

b. Place control on clean work bench. Position control so convergent exhaust nozzle control pneumatic drive assembly (air motor)(1, figure 10) can be easily removed.

c. Remove lockwire from screws(5) and (6) which hold air motor to control.

d. Clean area around split line between air motor and actuator and transmission assembly with clean cloth moistened with P-D-680, Type II petroleum solvent. Blow area dry with clean compressed air.

e. Remove screws(5) and (6) from air motor and actuator and transmission assembly junction. Discard screws.

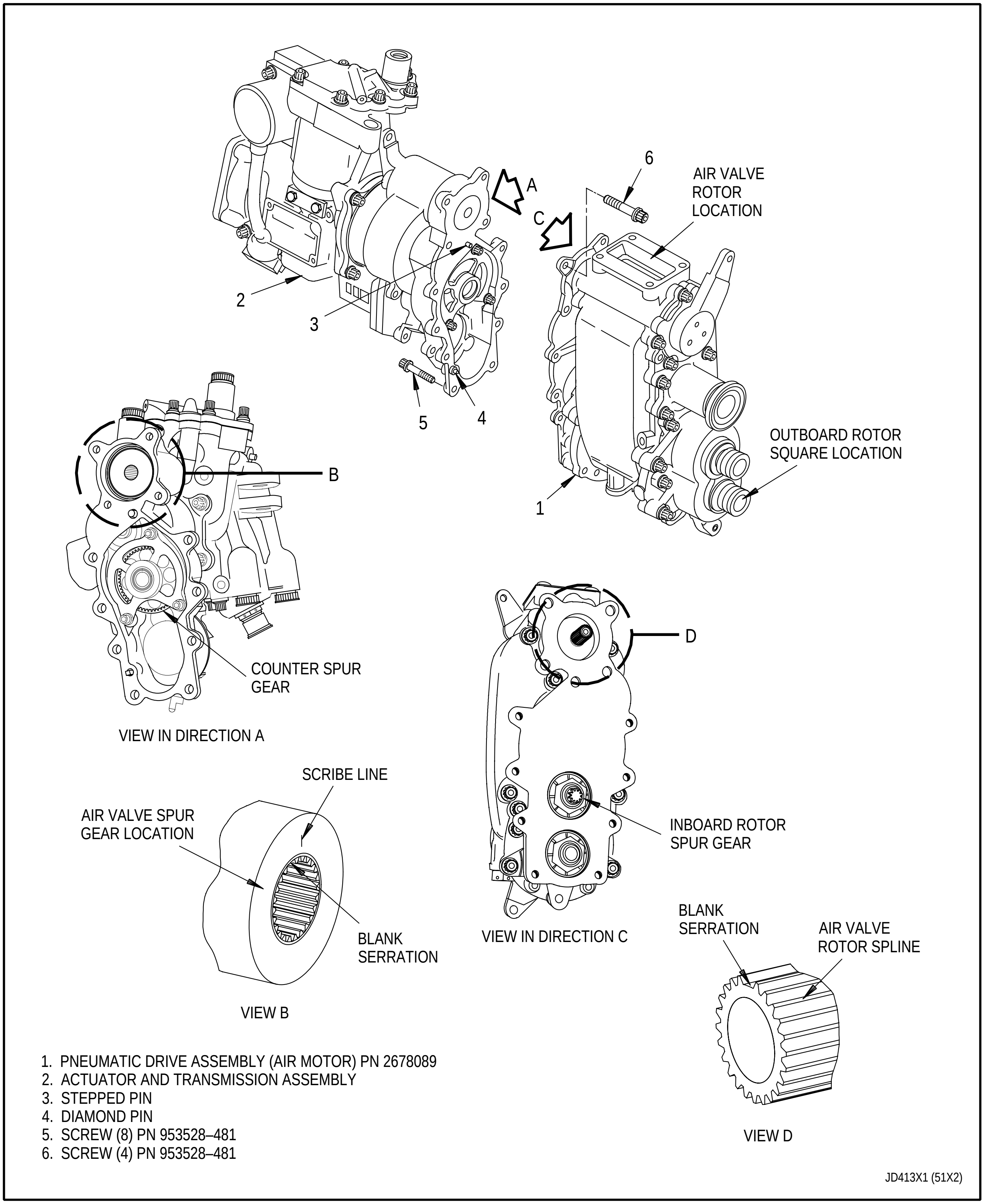


Figure 10. Convergent Exhaust Nozzle Control Pneumatic Drive Assembly (Air Motor) - Replacement

CAUTION

Contaminated assemblies are unserviceable.

f. Do not allow contaminants of any kind, solid or liquid, to be introduced into the CENC actuator and transmission assembly. Carefully remove air motor section from actuator and transmission assembly.

g. Remove replacement air motor from Bendix PN 351040A module kit and remove closure parts from air motor. Save closures for use on unserviceable air motor. Refer to T.O. 6J3-8-21-4.

CAUTION

If alignment is not correct, damage to gears may occur.

NOTE

Standard 1/4 inch socket extension inserted into outboard rotor may be used to help align inboard rotor spur gear with counter spur gear.

h. Position air valve rotor spline so that blank serration will align with air valve spur gear blank serration. Align inboard rotor spur gear with counter spur gear.

i. Carefully mate air motor with actuator and transmission assembly, engaging two alignment pins(3) and (4), while being careful not to damage gears.

j. Install screws(5) fingertight with heads facing transmission assembly. Install screws(6) fingertight with heads facing air motor.

NOTE

If torque values cannot be met, replace screws and recheck torque. If torque still cannot be met, replace control.

k. Torque screws 2 to 10 pound-inches using standard 1/4 inch, 12 point torque adapter extended perpendicular to wrench handle.

l. Torque screws in alternating sequence 20 to 25 pound-inches above torque recorded in step k.

NOTE

Lockwire is included in Bendix PN 351042A closure kit.

m. Lockwire screws.

n. Ensure rig point counter reads 500 and nozzle position transmitter white lines are in alignment. If not, refer to paragraph 6, step f.

o. Install convergent exhaust nozzle control. Refer to paragraph 7.

p. Install closure parts from Bendix PN 351042A closure kit on unserviceable air motor, and pack it in a shipping container. Refer to T.O. 6J3-8-21-4.

9. CONVERGENT EXHAUST NOZZLE CONTROL ELECTRO-HYDRAULIC SERVO VALVE (EHV) - REPLACEMENT.
(See Figure 11.)

CAUTION

Contamination of convergent exhaust nozzle control will make it unserviceable. Ensure all maintenance is done in an extremely clean area.

a. Place convergent exhaust nozzle control on a clean work bench so electro-hydraulic servo valve can be easily removed. If control is mounted on engine, disconnect electrical connector P92 from EHV.

b. Clean area around EHV with P-D-680, Type II petroleum solvent. Blow area dry with clean compressed air at less than 30 psig.

c. Remove screws(1, figure 11) and washers(2) from connector end of EHV and remove shims(3).

d. Put a container under control to catch any fuel as EHV is being removed.

e. Remove screws(5) and washers(6). Remove EHV(4). Remove and discard packings(7).

f. Remove replacement EHV from Bendix PN 351015 parts kit. Remove closure parts from EHV.

g. Lubricate packings(7) with VV-P-236 petrolatum. Install new packings(7) on EHV.

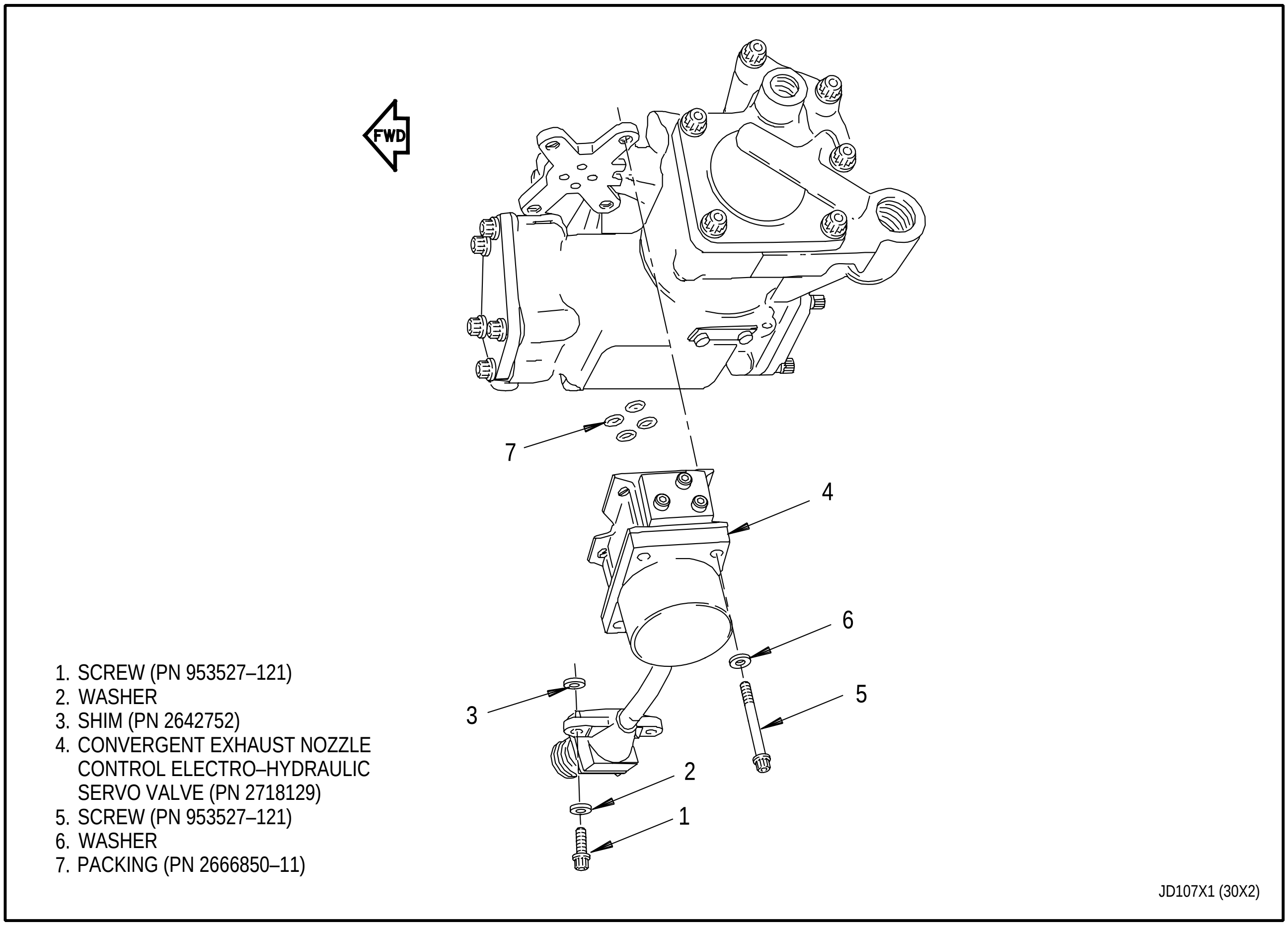


Figure 11. Convergent Exhaust Nozzle Control Electro-Hydraulic Servo Valve - Replacement

h. Install EHV(4) to control and secure with washers(6) and screws(5) fingertight.

CAUTION

If run-on torque cannot be met, replace screw and check run-on torque. If it still cannot be met, replace control.

i. Record torque required to install screws(5) into control. Torque shall be between 2 to 18 pound-inches.

j. Torque each screw 20 to 25 pound-inches above torque recorded in step i, in a criss-cross pattern.

k. Measure gap on both sides of electrical connector between mounting flange of connector and CENC with a feeler gage.

NOTE

The number of shims used shall equal the measured gap.

l. Install shims(3) equal to measured gap between electrical connector flange and CENC. Install washers(2) and screws(1) fingertight.

CAUTION

If run-on torque cannot be met, replace screw and check run-on torque. If it still cannot be met, replace control.

m. Record torque required to install screw(1) into control. Torque shall be between 2 to 10 pound-inches.

n. Torque screw 10 to 15 pound-inches above torque recorded in step m.

o. Preserve unserviceable EHV by completely filling it with MIL-L-6081, Grade 1010, 10 micron filtered oil. Do not immerse or oil flush electrical connector. Pour out oil after EHV has been thoroughly coated.

p. Install closure parts from replacement kit on unserviceable EHV and pack in shipping container.

10. CONVERGENT EXHAUST NOZZLE CONTROL - LEAK CHECK.
(See Figures 12 and 13.)

a. Leave the Pd port open.

b. Connect PWA 50096 tester EXTEND port hose to oil inlet adapter fitting.

c. Connect PWA 50096 tester RETRACT port hose to oil outlet adapter fitting.

NOTE

Refer to T.O. 33D4-6-617-1 for PWA 50096 test equipment operating instructions.

d. Turn pressure regulator valve counterclockwise to minimum setting.

CAUTION

Selector valve shall remain in EXTEND position during the leak check. Control damage may result if fluid flow is reversed.

e. Position selector valve to EXTEND position.

f. Connect PWA 50096 hydraulic cart to appropriate power source: 115 volts AC 50 to 400Hz.

g. Position circuit breaker ON.

h. Slowly turn pressure regulator valve clockwise to pump in MIL-L-6081, Grade 1010, engine oil. Increase pressure until gage reads between 40 and 60 psig.

i. Leak check control for 5 minutes.

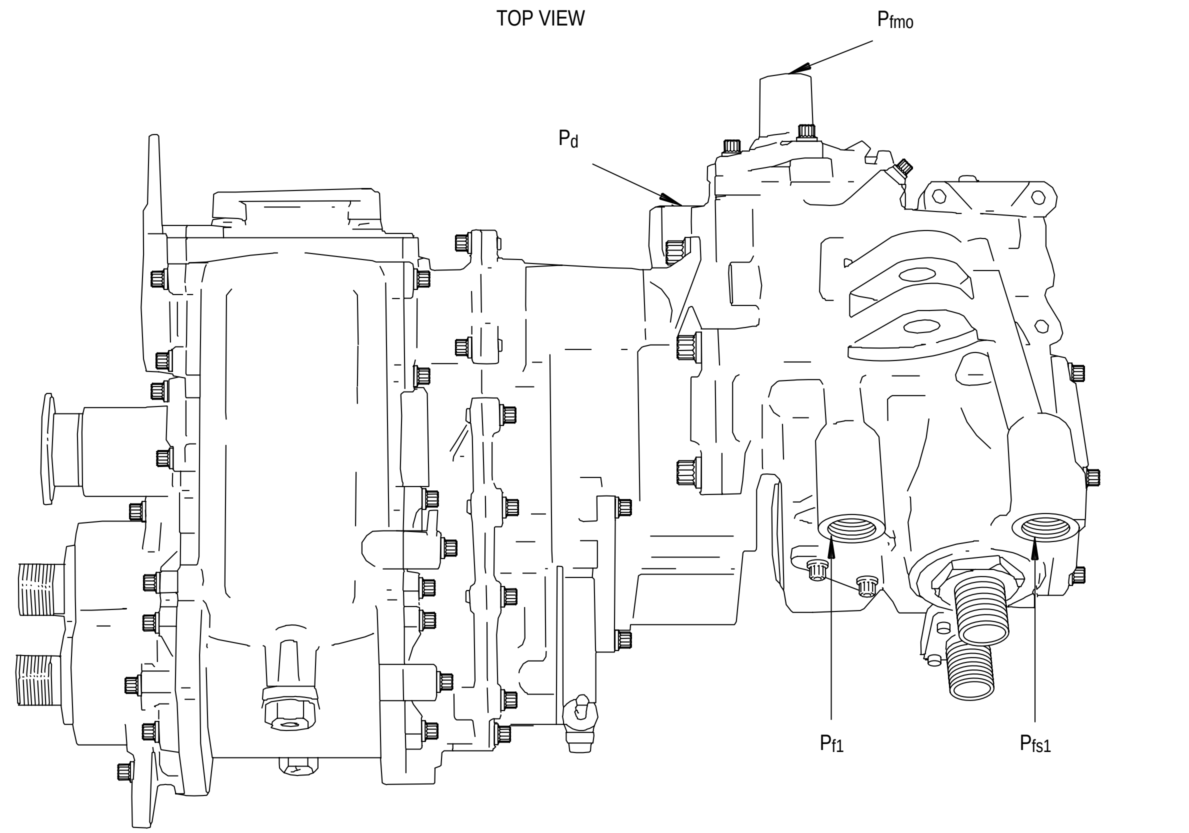


Figure 12. Convergent Exhaust Nozzle Control - Port Locations

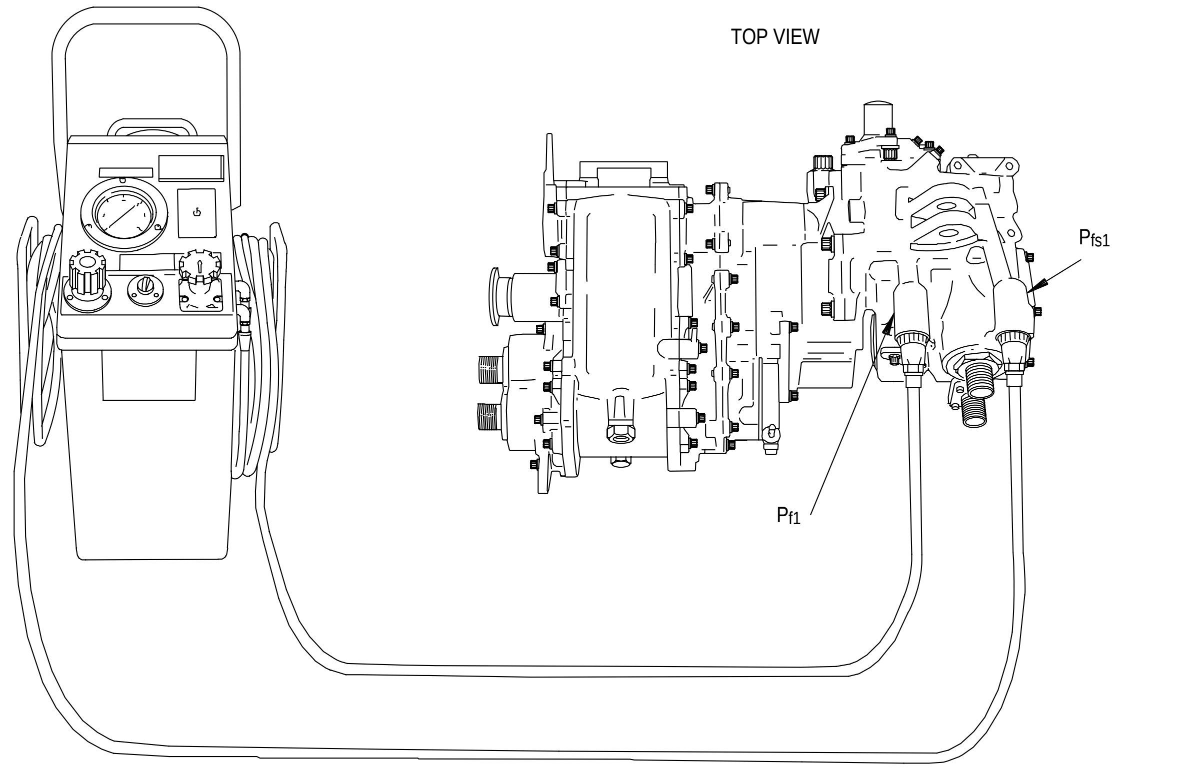


Figure 13. Convergent Exhaust Nozzle Control - Leak Check

m. If oil leaks from Pd port, shutdown hydraulic cart immediately. Check pressure level of hydraulic cart. If less than 50 psig, reject CENC.

n. Check control module. No leakage is allowed between module and control mating points. If control is leaking, shut down hydraulic cart and replace or repair unit as necessary.

o. If control does not leak, turn pressure regulator valve counterclockwise to minimum setting.

NOTE

Ensure pressure indicator stabilizes at minimum pressure before turning hydraulic cart off.

p. Position circuit breaker to OFF.

q. Disconnect PWA 50096 tester from power source.

r. Remove hoses from oil inlet and outlet adapter fittings.

s. Slowly remove Pf1 adapter port fitting. Allow any residual pressure to bleed from control.

t. Remove pfmo port cap.

u. Drain residual oil from control.

v. If no control preservation is required, cap all open fuel pressure ports.

11. FOLLOW-ON MAINTENANCE.

a. Perform rigging of control system. Refer to T.O. 2J-F100-53-4, WP 103 00.

12. CONVERGENT EXHAUST NOZZLE CONTROL - STORAGE AND SHIPMENT.

(See figures 2 and 3.)

NOTE

Preservation is required when a unit is to be stored for more than 30 days.

a. Remove all attaching parts. Refer to paragraph 3.

b. Fill all fuel ports with MIL-L-6081, Grade 1010 oil. Drain excess oil from unit. Cap all ports.

c. Install shipping caps.

d. Install protective closure and secure with screws.

e. Wipe external surfaces with a clean, dry, lint-free cloth.

f. Wrap in barrier material, MIL-B-121, Type II, Grade A, Class I or equivalent.

g. If control will be shipped, pack it in shipping container (use original shipping container, if possible). Cushion control with shock absorbent material.

WORK PACKAGE

TECHNICAL PROCEDURES

TRANSMITTER - POSITION, NOZZLE

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 14

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	26	4 - 7	0	9 - 13	0
2	0	8	22	14 Blank	2
3	26				

REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information - - - - - - - - - - - - - - -	T.O. 2J-F100-53-1
General Procedures -	WP 021 00
Engine Accessories and Rigging Procedures - - - - - - - - - - - -	T.O. 2J-F100-53-4
Control System - Exhaust Nozzle, Convergent - Rigging and Rigging Check -	WP 103 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Alcohol, denatured or	O-E-760, Type III
Trichloroethane inhibitor-1,1,1	O-T-620
Cloth, lint-free	-
Compound, antigalling (PWA 36035)	Fel-Pro C-300
Lockwire (0.032 inch diameter)	MS9226-04
Solvent, petroleum	P-D-680, Type II

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Pin, cotter	MS9245-28	1

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
6	Nozzle Position Transmitter - Installation Adapter - Augmentor nozzle actuator drive - - - - - - - - -	PWA 56639

ILLUSTRATED SUPPORT EQUIPMENT

Figure T1. Deleted.

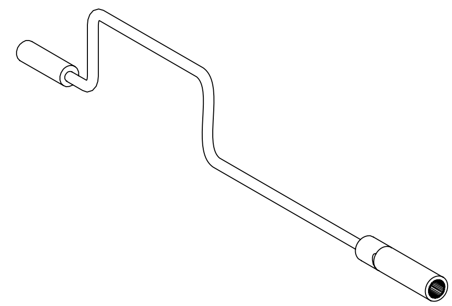


Figure T2. PWA 56639 Adapter

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures for the exhaust nozzle position transmitter:

- Removal
- Cleaning
- Inspection
- Installation

2. NOZZLE POSITION TRANSMITTER - REMOVAL.

(See Figure 1.)

a. Disconnect electrical connector P7 from nozzle position transmitter (ENPT). Place protective closure on J7 receptacle, if installed on engine.

b. Remove nut and bolt from clamp.

c. Rotate clamp so cutout in rear of clamp is between two scallop cuts in transmitter flange.

d. Spread clamp until entire transmitter flange is free. Remove transmitter. Do not remove clamp from control flange.

e. Install protective closure in clamp.

3. NOZZLE POSITION TRANSMITTER - CLEANING.

a. Using a clean cloth moistened with P-D-680, Type II petroleum solvent, wipe outside of nozzle position transmitter.

b. Wipe dry with a clean, lint-free cloth.

c. Remove protective closure from electrical cable connector P7. Clean connector, pins, socket, and cable insulation with O-E-760, Type III denatured alcohol or Trichloroethane inhibitor-1,1,1 O-T-620.

d. Dry cable connector with clean, compressed air. Replace protective closure on connector.

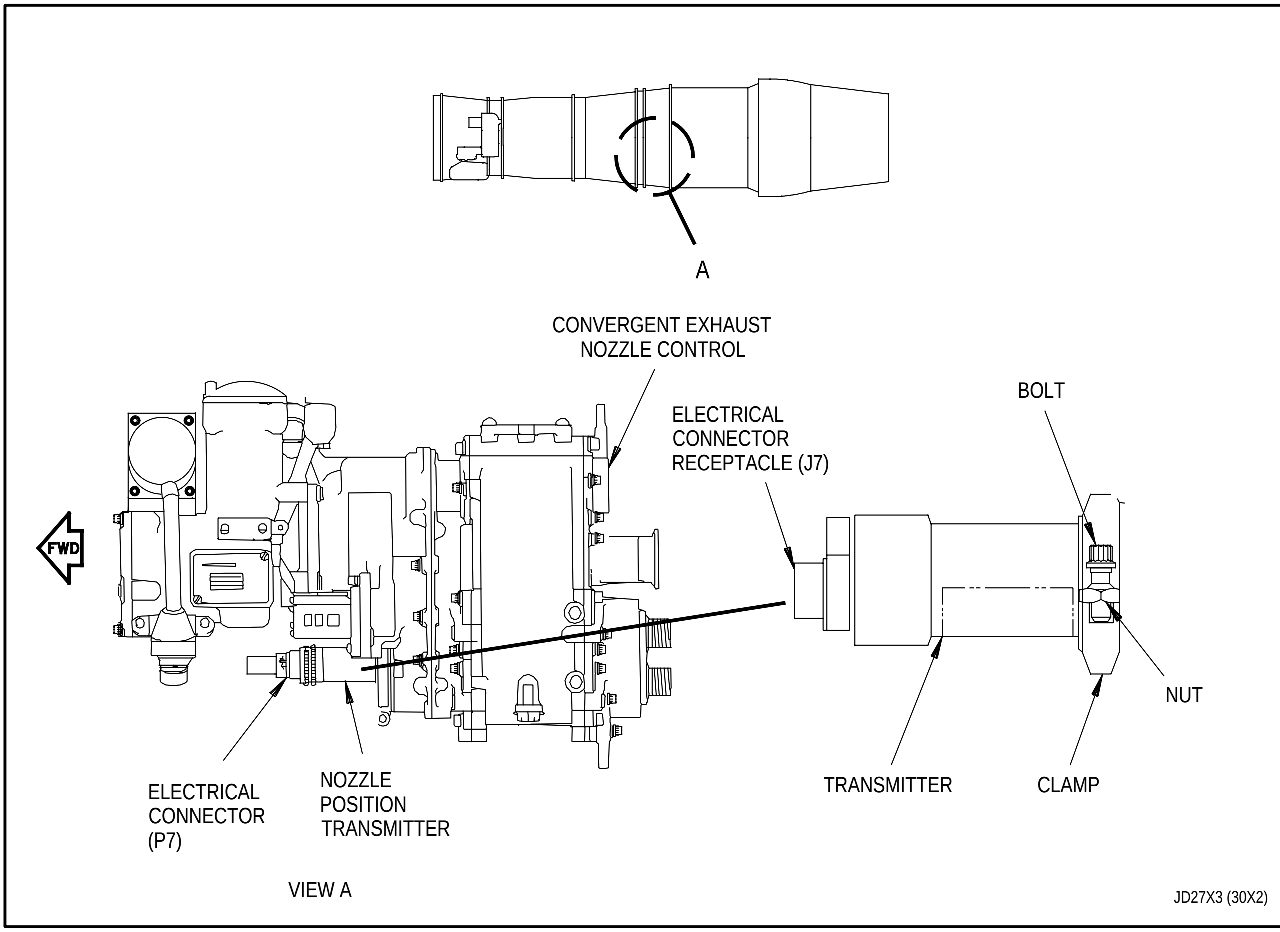


Figure 1. Nozzle Position Transmitter - Removal

4. NOZZLE POSITION TRANSMITTER - INSPECTION.

(See Figure 2.)

a. Inspect transmitter. (See figure 2.)

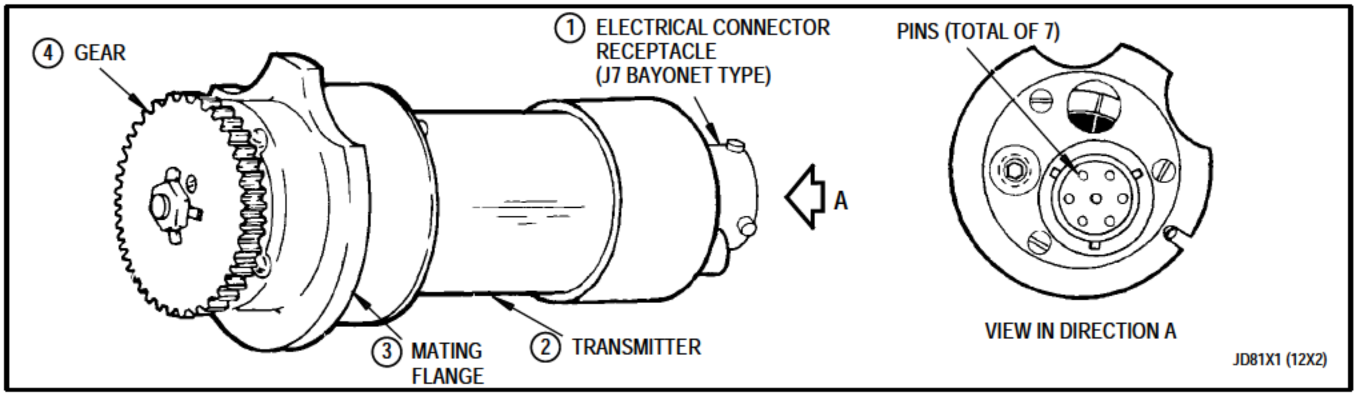


Figure 2. Nozzle Position Transmitter - Inspection

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Electrical connector receptacle -			
Broken,missing pins	Not serviceable	Not reparable	Replace transmitter.
Cracked pins	Not serviceable	Not reparable	Replace transmitter.
Bent pins	Not serviceable	See corrective action.	Straighten slightly bent pins. Refer to paragraph 5.
2. Transmitter -			
Dents,cracks	Not serviceable	Not reparable	Replace transmitter.
3. Mating flange -			
Broken edges	Not serviceable	Not reparable	Replace transmitter.
4. Gear -			
Loose	Not serviceable	Any amount	Replace transmitter.

5. ELECTRICAL CONNECTOR BENT PIN - REPAIR.

a. Protect pins with plastic sheath using needle nose pliers, mating socket, or small ID tube, straighten bent pins.

6. NOZZLE POSITION TRANSMITTER - INSTALLATION.

(See Figure 3.)

NOTE

The CENC rotor may bind when one air motor drive is rotated while setting CENC rig indicator and both primary flexible shafts are removed. This binding is normal if rotating the other air motor drive in the opposite direction eliminates the binding.

a. Open nozzle by installing PWA 56639 adapter through transmitter mount flange into output drive of convergent exhaust nozzle control. Using PWA 56639 adapter, turn drive clockwise (looking aft) and open nozzle until actuators contact their internal stops and nozzle is fully open. (See figure 3, sheet 1).

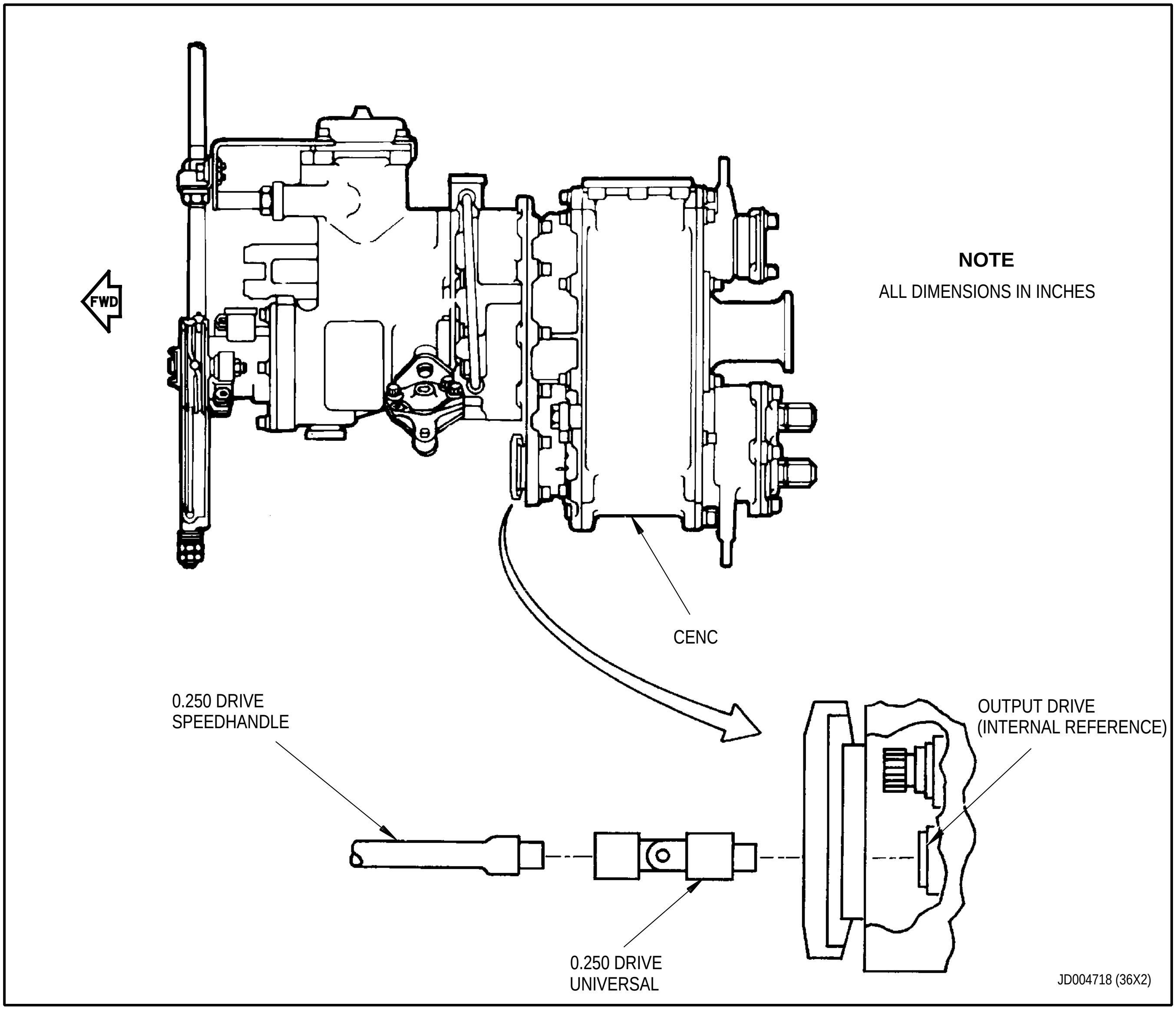


Figure 3. Nozzle Position Transmitter - Installation (Sheet 1 of 3)

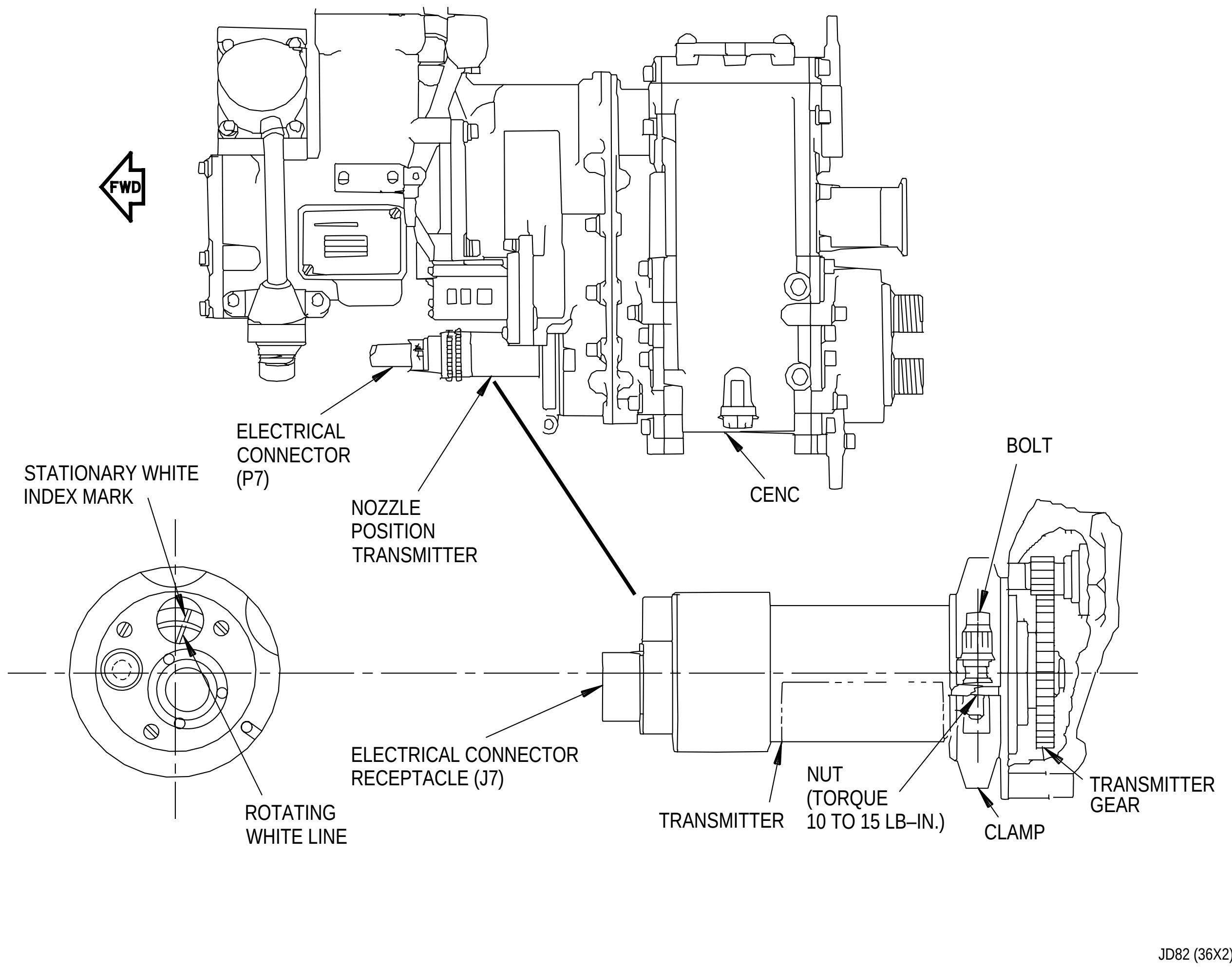


Figure 3. Nozzle Position Transmitter - Installation (Sheet 2 of 3)

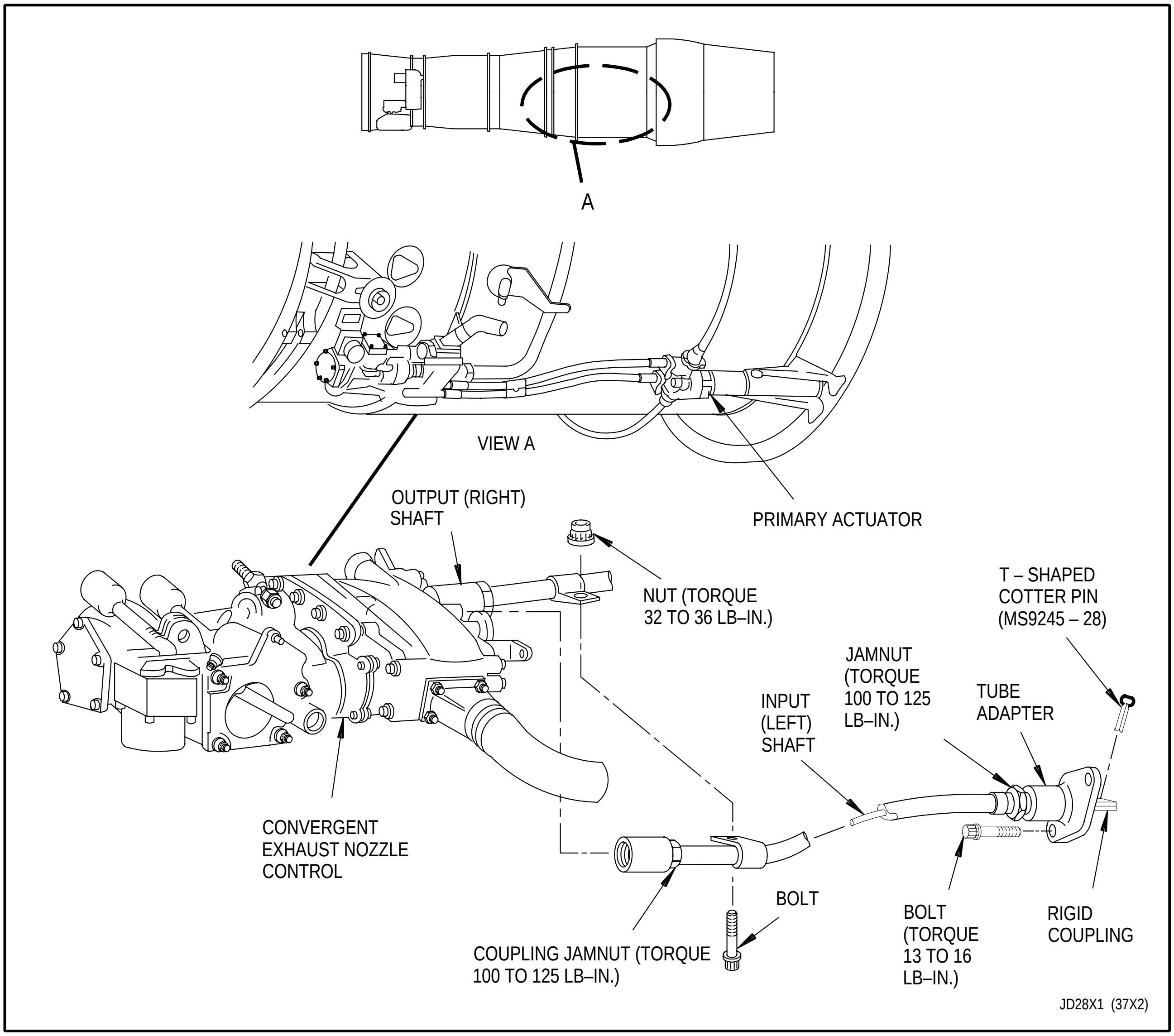


Figure 3. Nozzle Position Transmitter - Installation (Sheet 3 of 3)

b. With exhaust nozzle in full open position, control counter should register 500, which is control preset position.

c. If control counter reads 500, convergent exhaust nozzle control is in preset position. Proceed to step f. and install position transmitter.

d. If control counter does not read exactly 500, the convergent exhaust nozzle control system is not properly rigged and shall require rigging. Refer to T.O. 2J-F100-53-4, WP 103 00, before position indicator can be installed.

e. Preset nozzle position transmitter as follows: (See figure 3, Sheet 2.)

(1) Counter on convergent exhaust nozzle control shall read 500 before nozzle position indicator can be installed.

(2) If rotating white line is centered with stationary white index mark, transmitter may be installed. Refer to step f.

(3) If red band is positioned under stationary white index mark, rotate transmitter gear clockwise (facing gear) until rotating white line is centered with stationary white index mark.

(4) If green band is positioned under stationary white index mark, rotate transmitter gear counterclockwise (facing gear) until rotating white line is centered with stationary white index mark.

f. Install transmitter on control as follows: (See figure 3, Sheet 3.)

(1) Align slot in transmitter flange with pin in control flange.

(2) Rotate clamp so cutout in rear of clamp is between two scallop cuts in transmitter flange.

(3) Spread clamp and insert transmitter flange in clamp against control flange. Ensure aligning slot and pin are engaged.

(4) Rotate clamp so cutout aligns with a scallop cut in transmitter flange.

(5) Secure clamp on flanges with bolt and nut. Torque nut 10 to 15 pound-inches. Lockwire clamp bolt with PN MS9226-04 wire.

(6) Lockwire transmitter with index on front face with PN MS9226-04 wire.

g. Insert square drive end of flexible shaft into connection on control (figure 3, Sheet 3). Do not rotate driveshaft on control. Tighten coupling fingertight.

h. Engage splines of rigid coupling with splined drive of primary actuator. Do not rotate spline drive of actuator. Align cotter pin holes.

i. Flatten head of PN MS9245-28 cotter pin to make cotter pin T-shaped. Install cotter pin. Bend ends of cotter pin around rigid coupling.

j. Slide tube adapter in place against primary actuator. Apply PWA 30635 antigalling compound to threads of bolts. Install bolts and torque 13 to 16 pound-inches. Lockwire bolts with PN MS9226-02 wire.

k. Torque jamnut against coupling connected to control 100 to 125 pound-inches. Lockwire coupling with PN MS9226-02 wire.

l. Torque jamnut against tube adapter of shaft end connected to primary actuator 100 to 125 pound-inches. Lockwire jamnut with PN MS9226-02 wire.

m. Install bolt and nut in clamp to secure two shafts. Torque nut 32 to 36 pound-inches.

n. Remove protective closure from J7 electrical connector. Connect P7 cable connector to J7 receptacle on transmitter as follows:

(1) Align keyways and handtighten connector.

(2) Ensure red line on receptacle is not visible when viewed at right angles.

(3) Tighten connector firmly with soft-jawed pliers.

WORK PACKAGE

INTRODUCTION

RIGGING PROCEDURES

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 2

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2	24				

1. INTRODUCTION.

a. This work package introduces the 100 00 through 199 00 series of work packages for rigging procedures. The following work packages are included in this series:

WP No.	Title
101 00	Cylinders - Actuating, Linear, Variable Vane, Rear Compressor - Rigging
102 00	Control - Push-Pull, Rear Compressor Variable Vane, Feedback - Rigging
103 00	Control System - Exhaust Nozzle, Convergent - Rigging Check and Rigging
104 00	Rear Compressor Variable Vane Internal Rigging Check
105 00 through 199 00	Open

WORK PACKAGE

TECHNICAL PROCEDURES

CYLINDERS - ACTUATING, LINEAR, VARIABLE VANE, REAR COMPRESSOR -

RIGGING

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 16

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2	28	10 Blank	8	13	8
3 - 7	0	11	26	14 - 15	26
8	16	12	7	16 Blank	8
9	26				

REFERENCE MATERIAL REQUIRED

Title	Number
Standard Maintenance Procedures	T.O. 2-1-111
Engine Accessories and Rigging Procedures	T.O. 2J-F100-53-4
Control - Push-Pull, Rear Compressor Variable Vane Feedback - Rigging	WP 102 00
Hydraulic Pressure Tester PWA 50096	T.O. 33D4-6-617-1

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
COMPOUND, ANTIGALLING (PWA 36545)	ESNALUBE 382
COMPOUND, ANTIGALLING (PWA 474)	DC3400A OR ECOALUBE 642 OR LS2065

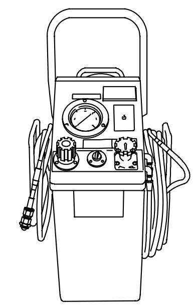
EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
COTTER PIN	MS9245-24	2
KEY WASHER	4004816	2

APPLICABLE SUPPORT EQUIPMENT

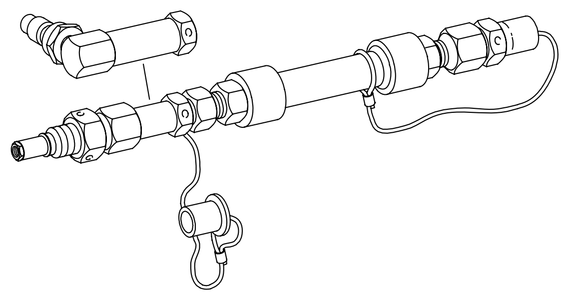
Paragraph	Function - Tool Nomenclature	Tool Number
3	Connecting Hydraulic Pressure Tooling to Engine	
	Adapter, Extend fitting ---------------	PWA 57103
	Adapter, Retract fitting --------------	PWA 57102
	Cart, Hydraulic pressure --------------	PWA 50096
4	Rear Compressor Variable Vane Linear Actuating Cylinders - Rigging	
	Fixture, rigging rear compressor variablevane, torquing ------------------------	PWA 57531

ILLUSTRATED SUPPORT EQUIPMENT



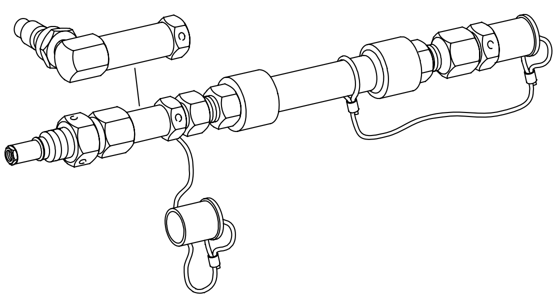
PWA 50096 –C

Figure T1. PWA 50096 Cart



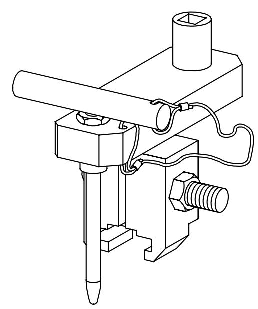
PWA 57102 –C

Figure T2. PWA 57102 Adapter



PWA 57103 –C

Figure T3. PWA 57103 Adapter



PWA 57531 –C

Figure T4. PWA 57531 Fixture

1. INTRODUCTION.

a. This work package contains the following instructions for rigging the rear compressor variable vane RCVV linear actuating cylinders.

- Preliminary instructions
- Connecting hydraulic pressure tooling to engine
- RCVV linear actuating cylinders - Rigging
- Follow-on maintenance

2. PRELIMINARY INSTRUCTIONS.

(See Figures 1, 2, and 3.)

CAUTION

- Do not bend end of RCVV feedback push-pull control more than 6 degrees maximum from control axis. Seal and support tube details will disengage from conduit end cap if bent more than 6 degrees from control axis. (See figure 1.)
- Pulley on main fuel control is spring loaded and will retract when RCVV feedback push-pull control(4, figure 2) is disconnected from compressor stator synchronizing arm(1). Push-pull control(4) shall be restrained to retract slowly or damage to pulley stop may occur.

a. Disconnect RCVV feedback push-pull control(4) from stator synchronizing arm(1) as follows:

(1) Restrain push-pull control(4).

(2) Remove cotter pin(2), nut(3), and bolt(5).

(3) Allow push-pull control(4) to retract slowly.

(4) Discard cotter pin(2).

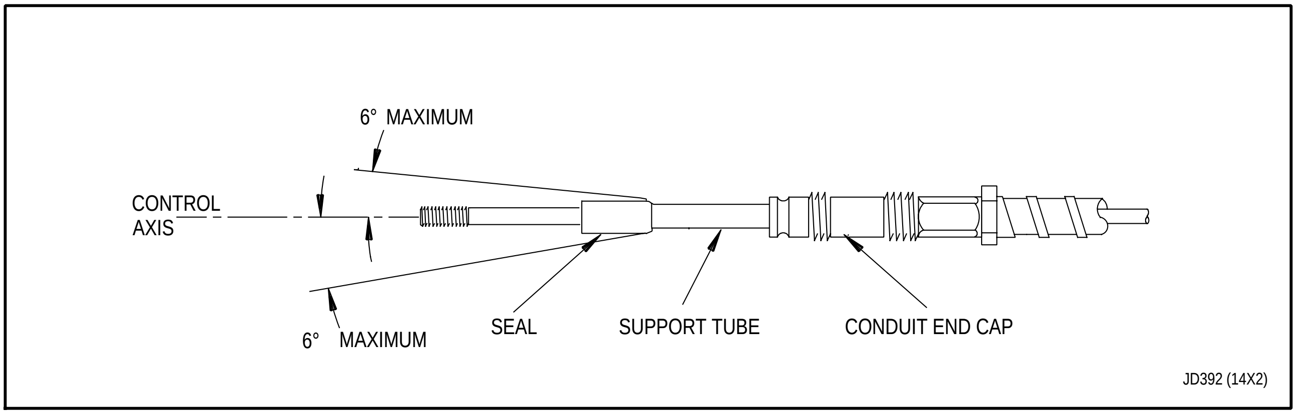


Figure 1. Caution for Handling Aft End of Rear Compressor Variable Vane Feedback Push-Pull Control

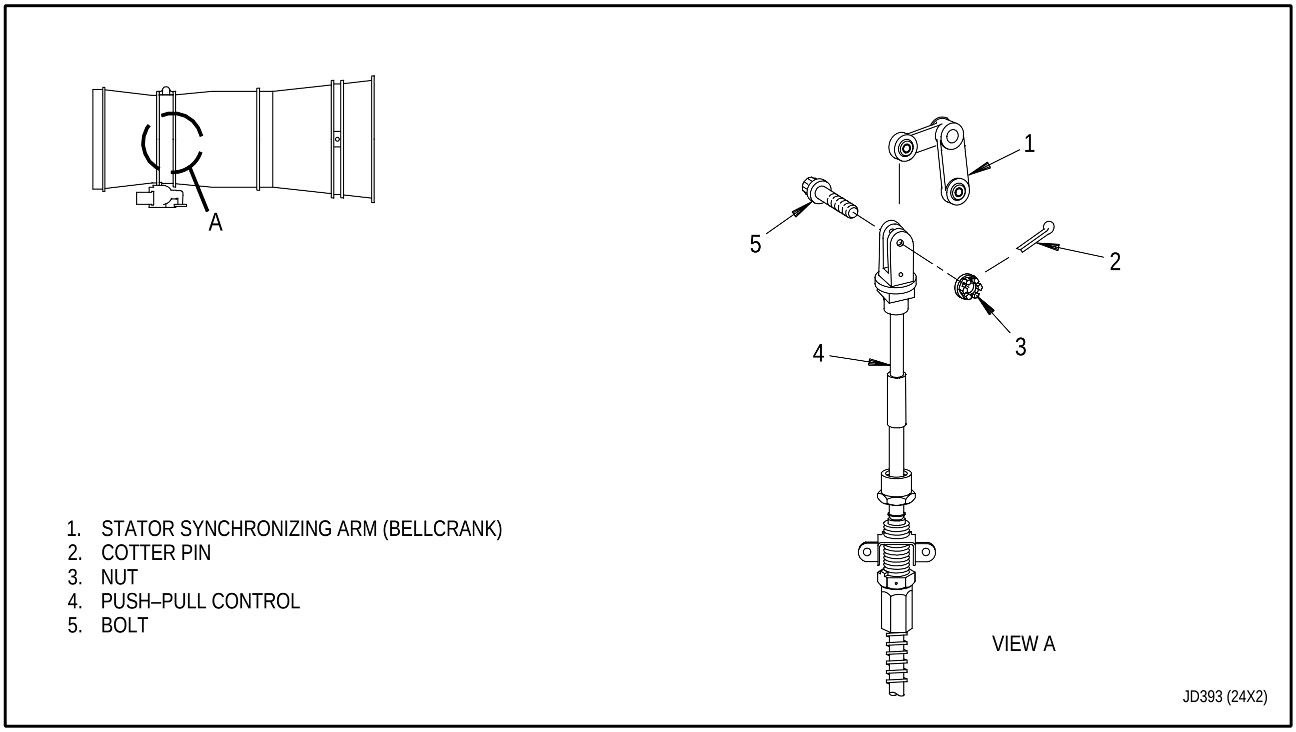


Figure 2. Rear Compressor Variable Vane Feedback Push-Pull Control - Disconnect From Stator Synchronizing Arm

NOTE

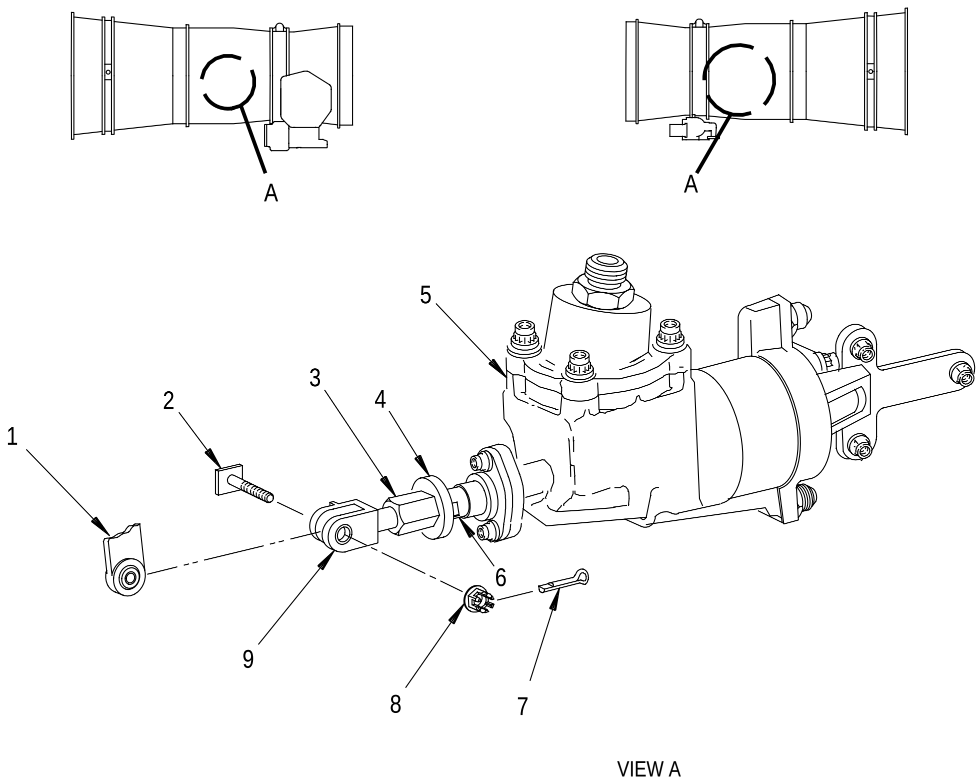
Rod end clevis(9, figure 3) on both sides of engine shall be removed from cylinder rod(6) for rigging.

b. Disconnect rod end clevis(9) from compressor stator linkage arm(1) and from linear actuating cylinder(5) as follows:

(1) Remove cotter pin(7), nut(8), and bolt(2). Discard cotter pin(7).

(2) Loosen sleeve nut(3).

(3) Remove rod end clevis(9), sleeve nut(3), and key washer(4) from linear actuating cylinder(5). Discard key washer(4).



1. COMPRESSOR STATOR LINKAGE ARM (BELLCRANK)
2. BOLT
3. SLEEVE NUT
4. KEY WASHER
5. LINEAR ACTUATING CYLINDER
6. CYLINDER ROD
7. COTTER PIN
8. NUT
9. ROD END CLEVIS

JD394 (37X2)

Figure 3. Removing Rod End Clevis from Linear Actuating Cylinder

3. CONNECTING HYDRAULIC PRESSURE TOOLING TO ENGINE.
(See Figure 4.)

a. Connect PWA 50096 hydraulic test cart to engine as follows: (See figure 4.)

(1) Remove lockwire and remove plugs from extend and retract fittings(1 and 2). Discard packings.

(2) Connect PWA 57102(3) and PWA 57103(4) adapters to retract(2) and extend(1) test fittings respectively.

(3) Connect hoses from PWA 50096 hydraulic test cart to adapters.

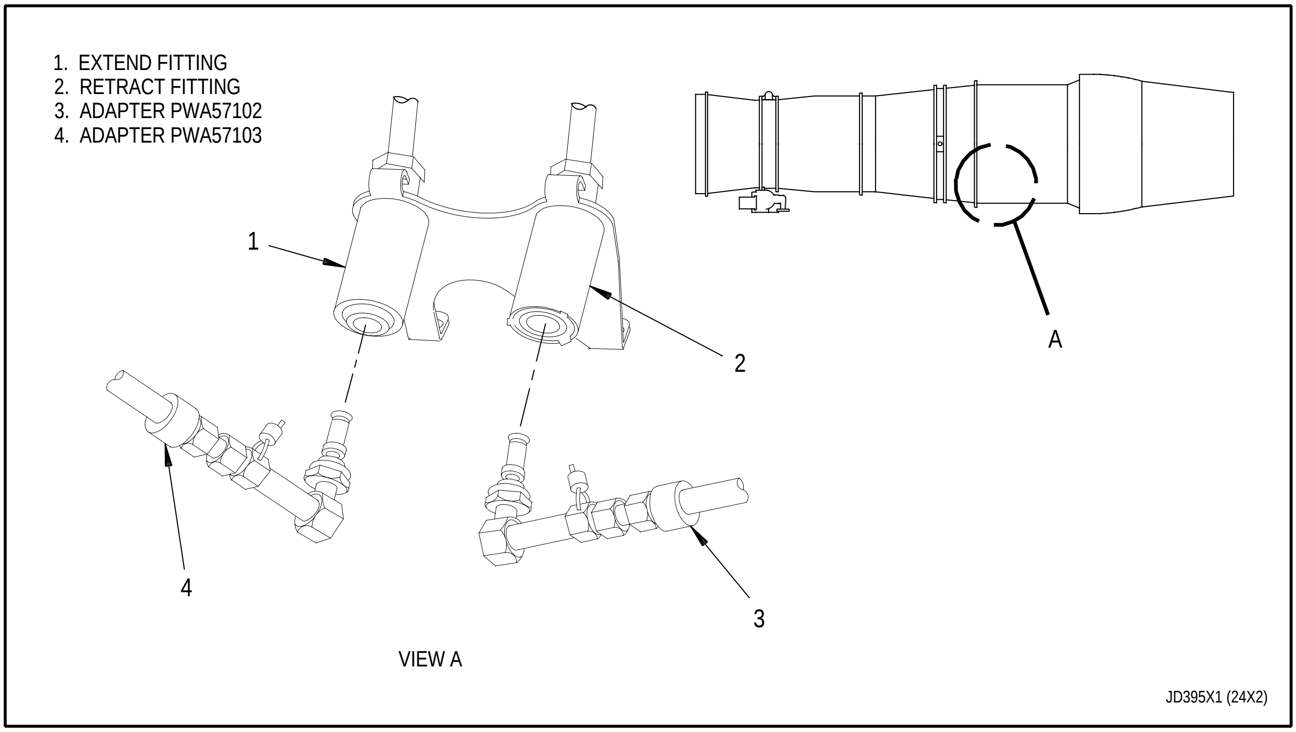


Figure 4. Connecting Hydraulic Pressure Tooling to Engine

4. REAR COMPRESSOR VARIABLE VANE (RCVV) LINEAR ACTUATING CYLINDERS - RIGGING.
(See Figures 5 through 7.)

CAUTION

Do not exceed 250 psig pressure. Damage to engine hardware may result.

NOTE

Refer to T.O. 33D4-6-617-1 for operating instructions for PWA 50096 hydraulic pressure tester.

a. Using PWA 50096 hydraulic cart, apply 100 to maximum of 250 psig pressure to position RCVV linear actuating cylinders in retracted position.

NOTE

- PWA 57531 fixtures are initially used to check movement of linkage arm and shaft by applying torque in both forward and rearward direction. It does not matter which direction is checked first.
- Ensure that PWA 57531 fixture is positioned on link arm to engage center pivot directly under 3/8 inch drive socket of fixture.

b. Install PWA 57531 rigging fixtures onto RCVV linkage arms on both sides of engine as follows:

(1) Remove T-Pin from fixture assembly and spread clamps to fit over RCVV linkage arm by loosening nut.

(2) Engage fixture clamp grooves in linkage arm.

(3) Align fixture square drive directly over RCVV linkage arm post by installing T-Pin through fixture and into RCVV linkage arm end bolthole.

(4) Secure fixture in place by tightening fixture nut.

CAUTION

T-Pin shall be removed prior to torque checks and rigging to prevent damage to engine parts.

(5) Remove T-Pin from linkage arm and fixture.

c. Actuate RCVV system as follows:

(1) Insert standard beam or dial type torque wrenches into PWA 57531 fixture on both sides of engine.

CAUTION

Exceeding specified torque on either side of engine may cause damage to engine hardware.

(2) Simultaneously apply minimum torque required to actuate right and left side RCVV system bellcranks from stop to stop a minimum of 3 times. Do not exceed 650 pound-inches torque. Torque applied to each side must stay within 50 pound-inches of each other.

(3) Record value of maximum torque required to actuate each bellcrank(1) toward cylinders(5) and contact internal rigging stops. If torque exceeds 500 pound-inches, inspect RCVV system to determine cause of binding or interference.

CAUTION

Exceeding specified hydraulic pressure may cause damage to engine hardware.

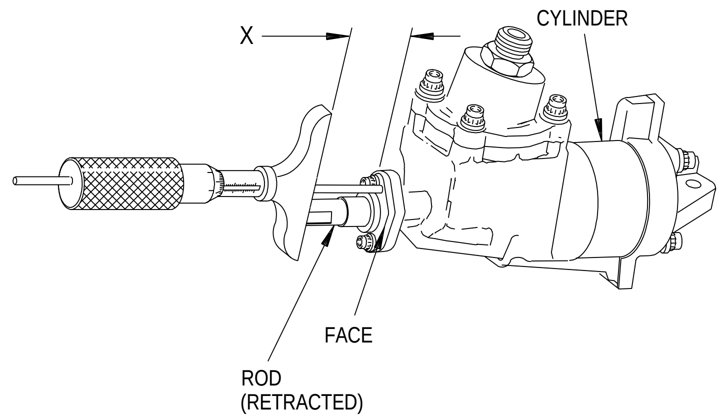
(4) Using hydraulic pressure of 100 to maximum of 250 psig, actuate cylinder from full retract to full extend position.

(5) Measure stroke length of both actuator cylinders. Actuator cylinder stroke shall be within acceptable range for cylinder PN being measured. If stroke length is not within range, replace cylinder. (See figure 5.)

(6) Return cylinder to full retract position.

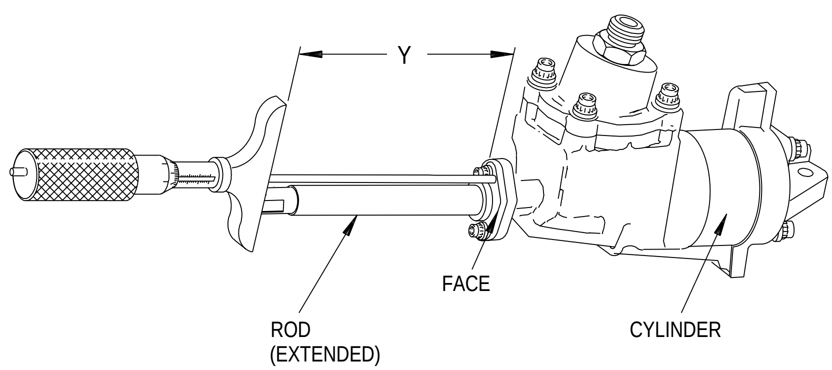
a. ACTUATE CYLINDER TO FULL RETRACT POSITION.

b. MEASURE DISTANCE FROM END OF ROD TO FACE OF CYLINDER. RECORD DIMENSION X.



c. ACTUATE CYLINDER TO FULL EXTEND POSITION

d. MEASURE DISTANCE FROM END OF ROD TO FACE OF CYLINDER. RECORD DIMENSION Y.



e. SUBTRACT DIMENSION X FROM DIMENSION Y TO OBTAIN CYLINDER STROKE. IF STROKE IS WITHIN ACCEPTABLE STROKE LIMITS, CYLINDER IS SERVICEABLE. IF STROKE IS NOT WITHIN ACCEPTABLE STROKE LIMITS, REPLACE CYLINDER.

ACTUATING CYLINDER PN	ACCEPTABLE STROKE LIMITS
441293	1.286 TO 1.334
441720	1.180 TO 1.220

NOTE

ALL DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED

104577 (48X2)

Figure 5. Rear Compressor Variable Vane Linear Actuating Cylinder - Cylinder Stroke Inspection

d. Secure rod end clevis(1, figure 6) to linear actuating cylinder(3) as follows:

(1) Apply a light coat of PWA 474 antigalling compound on threads of rod end clevis(1).

NOTE

Do not tighten sleeve nut(5) or bend tab washer(4) until directed to do so.

(2) Install sleeve nut(5) on rod end clevis(1) covering second set of threads with nut. Do not tighten.

(3) Position key washer(4) on end of rod end clevis(1) against sleeve nut(5) with tab in slot of rod end clevis(1). Do not bend tab.

NOTE

- First set of threads on end of clevis(1) shall not show beyond end of cylinder rod(2).
- Full threaded clevis with spherical indent, spherical indent shall not protrude from cylinder rod.

(4) Turn rod end clevis(1) into cylinder rod(2) all the way.

(5) Perform above steps 1 through 4 for linear actuating cylinder on opposite side of engine.

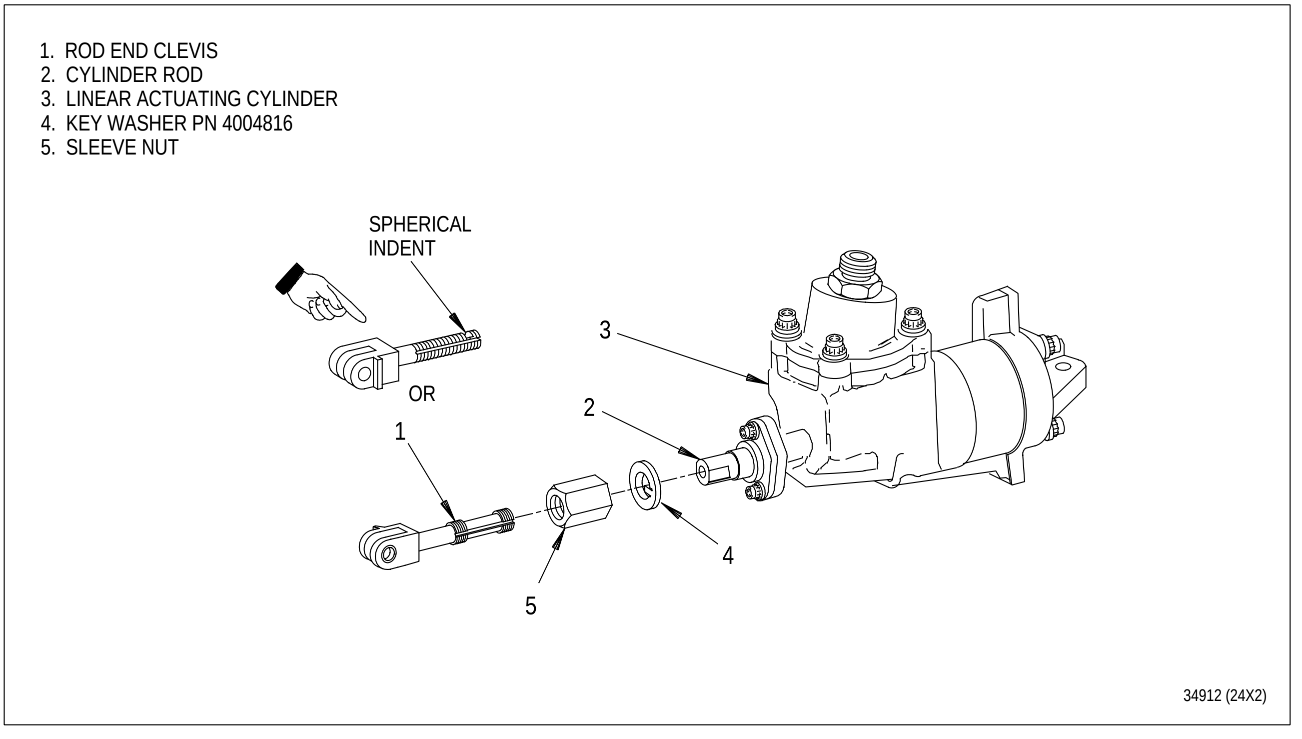


Figure 6. Attaching Rod End Clevis to Linear Actuating Cylinder

e. Secure rod end clevis(9, figure 7) to compressor stator linkage arm(1) on each side of engine as follows:

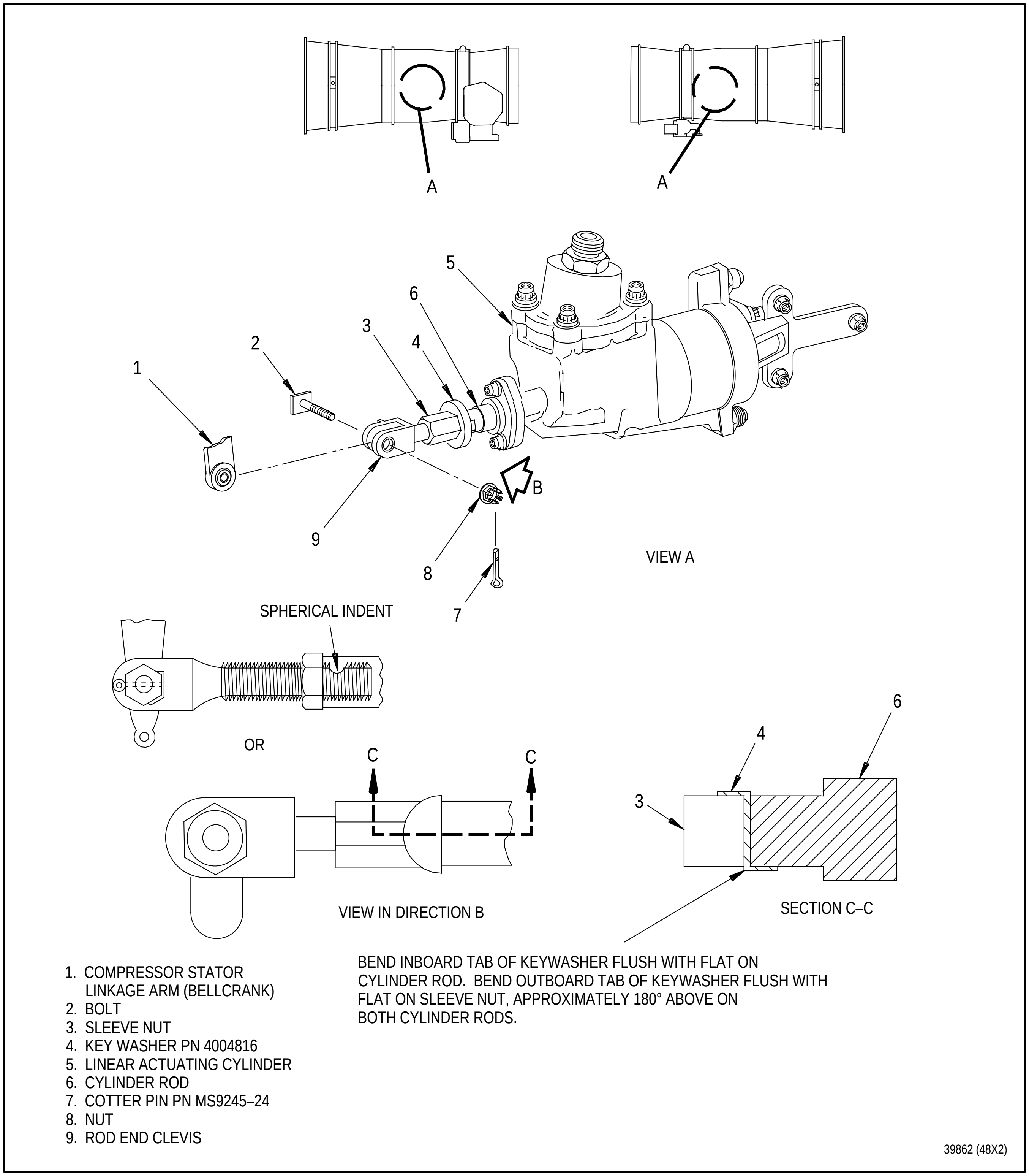


Figure 7. Rear Compressor Variable Vane Linear Actuating Cylinders - Rigging

NOTE

The length from the end of each rod to front cover of the cylinder shall be approximately equal.

(1) Measure distance from cylinder rod end to cylinder cover on each side of engine. Distances shall be approximately equal.

(2) Insert standard beam or dial type torque wrenches into PWA 57531 fixtures on both left and right sides of engine.

(3) Simultaneously actuate arm of both bellcranks(1) toward cylinders(5) with 550 to 600 pound-inches while maintaining hydraulic pressure on cylinders in the retracted position.

NOTE

Steps (4) through (14) apply to cylinders on both sides of engine.

(4) Maintain pressure on cylinders to keep cylinders in the retracted position when assembling clevis to linkage arm.

(5) Apply a light coat of PWA 36545 antigalling compound to threads of nuts(8).

(6) Align bolt holes of rod end clevises(9) with compressor stator linkage arms(1) by adjusting rod end clevises(9) while simultaneously maintaining 550 to 600 pound-inches of torque on both compressor stator linkage arms(1). Proper adjustment of actuator clevis is achieved when attachment bolt can pass freely through bellcrank uniball hole and mating hole in actuator clevis, while maintaining bellcrank torques and hydraulic pressure on actuators.

(7) Tighten sleeve nuts(3) against key washers(4). Torque sleeve nuts 160 to 180 pound-inches.

(8) Turn off PWA 50096 hydraulic pressure cart.

(9) Secure clevises(9) and linkage arms(1) using bolts(2) and nuts(8). Position bolt heads(2) towards engine by rotating cylinder rod.

(10) Tighten nuts(8) 15 to 30 pound-inches, aligning holes in nuts(8) with holes in bolts(2).

(11) Install and secure cotter pins(7).

(12) Bend tabs of key washers(4) against flat of cylinder rod(6) and flat of sleeve nut(3) 180 degrees apart.

(13) Verify that key washers are properly bent (proper gap) using a feeler gauge. Refer to T.O. 2-1-111.

(14) Remove PWA 57531 fixture from both sides of engine.

(15) Using PWA 50096 hydraulic cart apply pressure of 100 to 250 psig to actuate cylinders simultaneously in both directions. There shall be no binding. A slight hesitation at the start of each stroke is permissible.

5. FOLLOW-ON MAINTENANCE.

NOTE

PWA 57102 and PWA 57103 test adapters and PWA 50096 hydraulic test cart remain installed for use in rigging RCVV feedback push-pull control.

a. Rig RCVV feedback push-pull control. Refer to WP 102 00.

WORK PACKAGE

TECHNICAL PROCEDURES

CONTROL - PUSH-PULL, REAR COMPRESSOR VARIABLE VANE FEEDBACK - RIGGING

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 12

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	13	5 - 7	0	9	0
2	0	8	13	10	13
3 - 4	13			11 - 12	0

REFERENCE MATERIAL REQUIRED

Title	Number
Engine Accessories and Rigging Procedures ----------	T.O. 2J-F100-53-4
Cylinder - Actuating, Linear, Variable Vane, Rear Compressor - Rigging ----------------------	WP 101 00
Hydraulic Pressure Tester PWA 50096 --------------	T.O. 33D4-6-617-1

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Compound, antigalling, (PWA 550)	Hi-T-650 or Lubri-Bond HT
Lockwire (0.032 inch diameter)	MS9226-04
Oil, lubricating	MIL-L-7808 or
Petrolatum	VV-P-236

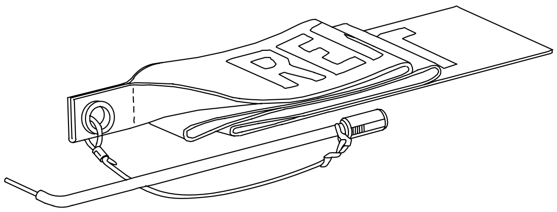
EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Cotter pin	MS9245-24	1
Packing, preformed	MS9966-04	2

APPLICABLE SUPPORT EQUIPMENT

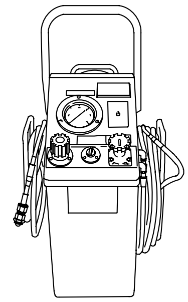
Paragraph	Function - Tool Nomenclature	Tool Number
2,3,4,5	Rear Compressor Variable Vane Feedback Push-Pull Control - Rigging	
	Cart, Hydraulic Pressure ---------------	PWA 50096
	Adapter, Retract Fitting ---------------	PWA 57102
	Adapter, Extend Fitting ---------------	PWA 57103
	Pin, Fuel control rear compressor variable vane feedback pulley -------------------	PWA 57137

ILLUSTRATED SUPPORT EQUIPMENT



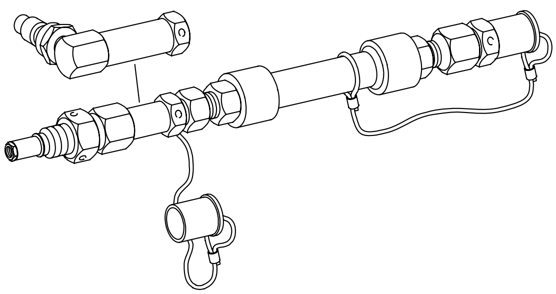
PWA 57137 –C

Figure T1. PWA 57137 Pin



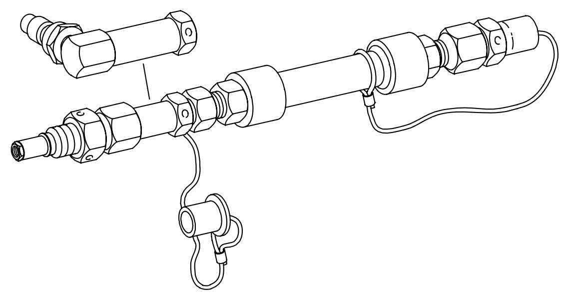
PWA 50096 –C

Figure T2. PWA 50096 Cart



PWA 57103 –C

Figure T3. PWA 57102 Adapter



PWA 57102 –C

Figure T4. PWA 57103 Adapter

1. INTRODUCTION.

a. This work package contains instructions for the following maintenance procedures for rigging the rear compressor variable vane (RCVV) feedback push-pull control:

- Preliminary instructions
- Preparation for rigging
- Rigging
- Freedom of movement check
- Removing hydraulic pressure tooling from engine

2. REAR COMPRESSOR VARIABLE VANE FEEDBACK PUSH-PULL CONTROL - PRELIMINARY INSTRUCTIONS (RIGGING).

NOTE

RCVV linear actuating cylinder shall be rigged prior to rigging RCVV feedback push-pull control.

a. Verify that RCVV linear actuating cylinders were rigged. If cylinders were not rigged, refer to WP 101 00.

NOTE

RCVV feedback push-pull control should have been left disconnected at completion of RCVV linear actuating cylinder rigging.

b. Verify that RCVV feedback push-pull control is disconnected from stator synchronizing arm. If RCVV feedback push-pull control is not disconnected, refer to WP 101 00.

NOTE

PWA 50096 hydraulic pressure cart, PWA 57102 adapter, and PWA 57103 adapter should have been left installed at completion of RCVV linear actuating cylinder rigging.

c. Verify that PWA 50096 hydraulic pressure cart, PWA 57102 adapter, and PWA 57103 adapter are connected to engine. If PWA 50096 hydraulic pressure cart, PWA 57102 adapter, and PWA 57103 adapter are not installed, refer to WP 101 00.

3. REAR COMPRESSOR VARIABLE VANE FEEDBACK PUSH-PULL CONTROL - PREPARATION FORRIGGING.
(See Figure 1.)

a. Remove lockwire from nuts(2 and 3, figure 1) retaining push-pull control(4) to lug on main fuel control.

NOTE

Do not remove nuts(2 and 3).

b. Hold hex on push-pull control(4) and loosen nuts(2 and 3).

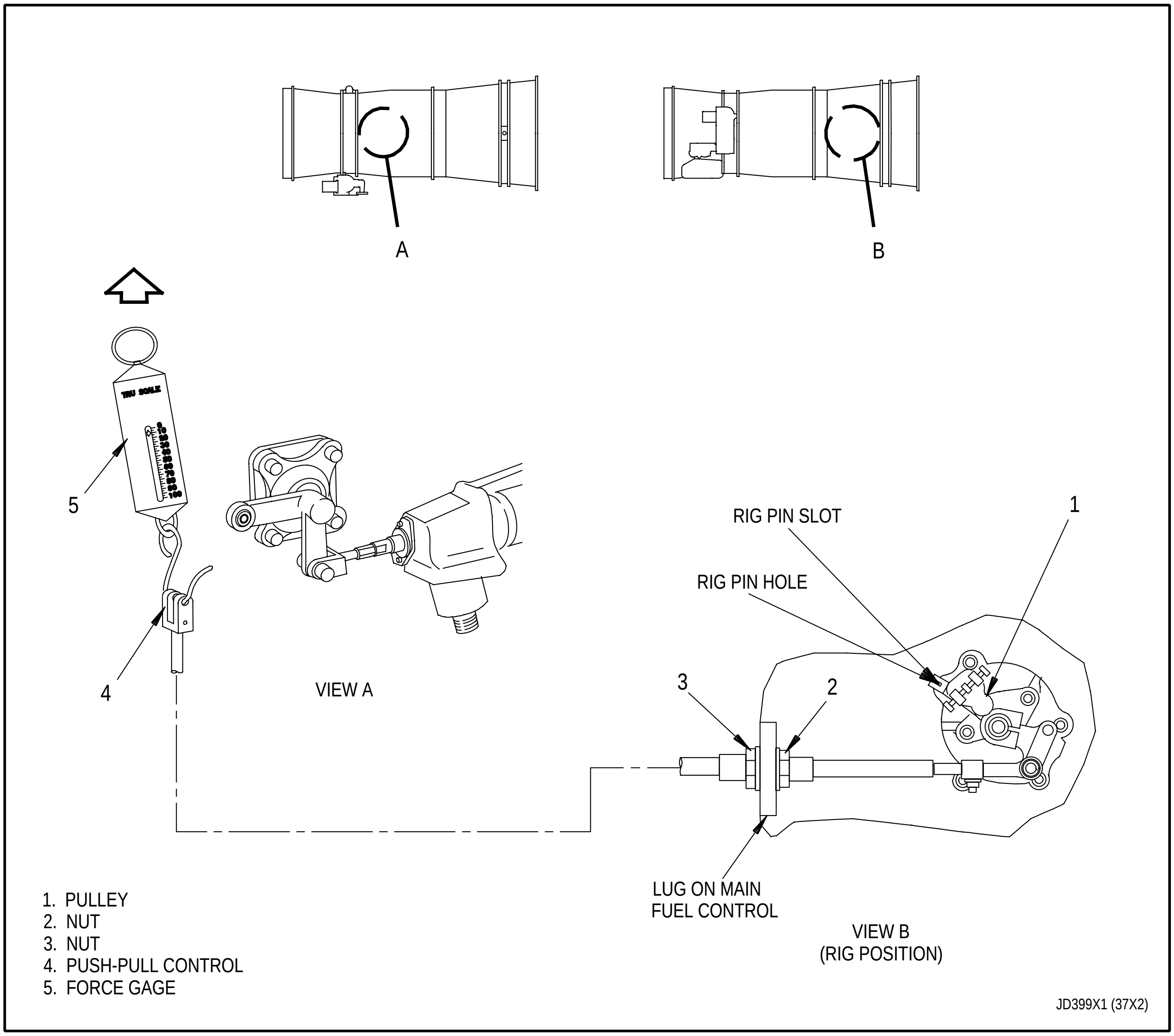


Figure 1. RCVV Feedback Push-Pull Control - Preparation for Rigging

CAUTION

Pulley(1) on main fuel control is spring loaded and will retract when tension on push-pull control(4) is released. Push-pull control(4) shall be restrained to retract slowly or damage to pulley stop may occur.

NOTE

- Pulley(1) on main fuel control is in rig position when slot in pulley lines up with rig pin hole.
- Tension at the rig position shall be between 8.0 and 25.0 pounds.

c. Inspect cable for freedom of movement.

d. Using a force gage(5) apply tension to actuator end of push-pull control(4) to rotate pulley(1) on main fuel control to rig position.

e. If tension required to rotate pulley(1) on main fuel control is less than 8 pounds or greater than 25 pounds replace main fuel control and repeat steps a through e.

4. REAR COMPRESSOR VARIABLE VANE FEEDBACK PUSH-PULL CONTROL - RIGGING. (See Figure 2.)

NOTE

Refer to T.O. 33D4-6-617-1 for operating instructions for PWA 50096 hydraulic pressure cart.

a. Using PWA 50096 hydraulic pressure cart, apply 100 to 250 psig maximum pressure to position RCVV cylinders(8, figure 2) in retracted position.

NOTE

Maintain pressure on cylinders to keep cylinders in retracted position during remaining rigging procedure steps.

b. Insert PWA 57137 rigging pin through slot in pulley and into rigging hole.

c. Adjust nuts(1 and 2) at main fuel control lug until bolthole of push-pull control rod end clevis(3) lines up with bolthole on stator synchronizing arm(7).

CAUTION

Failure to follow proper torquing procedures and limits may cause hardware damage.

d. Torque nut(4) securing rod end clevis(3) to stator synchronizing arm(7) and install cotter pin(5) as follows:

(1) Connect rod end clevis(3) to stator synchronizing arm(7) with bolt(6) and nut(4) fingertight.

(2) Attach 3/8 inch crowfoot wrench to 0 to 30 pound-inches torque wrench, and position at 90 degree angle to one another.

(3) Place crowfoot wrench on nut(4). Hold bolthead(6) with another wrench. Tighten nut(4). Record torque required to tighten nut(4) without contact face of clevis(3) (run-on torque).

(4) If torque is less than 2 pound-inches replace nut(4) or bolt(6) or both and repeat step d.(2) through (4).

(5) Torque nut(4) 2.5 to 8.0 pound-inches above run-on torque recorded in step d.(3).

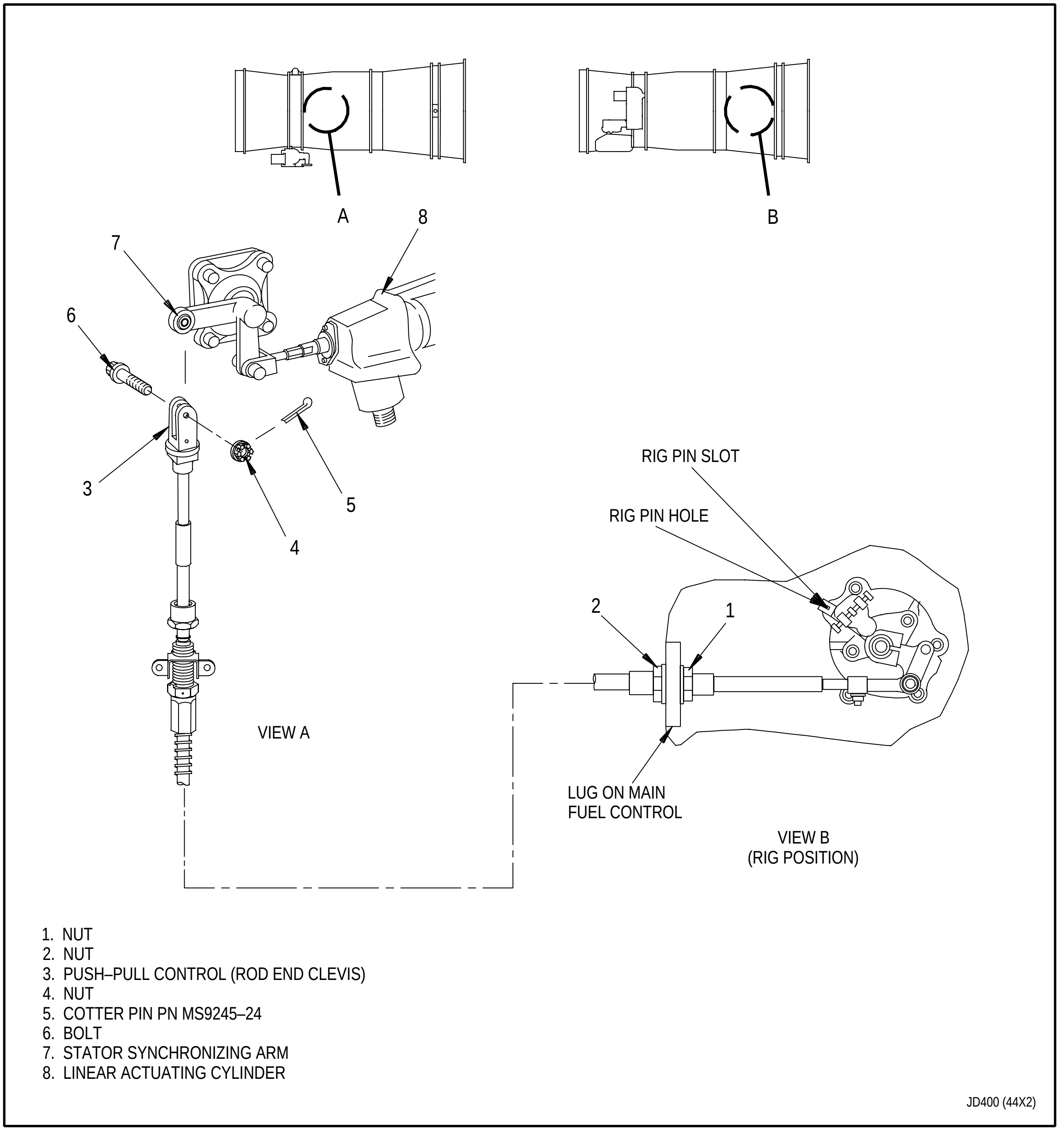


Figure 2. RCVV Feedback Push-Pull Control - Rigging

NOTE

Do not loosen nut to install cotter pin(5).

(6) Install new cotter pin(5). If cotter pin(5) cannot be installed, tighten nut(4) to align slot in nut(4) with hole in bolt(6). Do not exceed 8 pound-inches above run-on torque recorded in step c.(3).

(7) If cotter pin hole alignment is not obtained, loosen nut(4) and repeat steps c.(2) through (5).

(8) If cotter pin hole alignment is still not obtained, replace nut(4) or bolt(6) or both and repeat steps c.(2) through (5).

(9) Install and secure cotter pin(5).

(10) Adjust nuts (1 and 2) until PWA 57137 rigging pin can be easily removed and installed.

NOTE

Threads shall not protrude beyond end of nuts(1 and 2).

(11) Torque nuts(1 and 2) simultaneously 80 to 90 pound-inches.

NOTE

Correct adjustment of push-pull control is ensured if PWA 57137 rigging pin can be easily removed and installed through rig pin slot and into rig pin hole without moving cable.

(12) Ensure push-pull control is correctly adjusted.

(13) Lockwire nuts(1 and 2) using PN MS9226-04 wire.

(14) Remove PWA 57137 rigging pin.

5. REAR COMPRESSOR VARIABLE VANE (RCVV) FEEDBACK PUSH-PULL CONTROL - FREEDOM OF MOVEMENT CHECK.

CAUTION

PWA 57137 rigging pin shall be removed before actuating RCVV linear actuating cylinders to prevent hardware damage.

a. Ensure PWA 57137 rigging pin is removed before actuating RCVV linear actuating cylinders.

b. Using PWA 50096 hydraulic pressure cart, apply 100 to 250 psig pressure to simultaneously actuate RCVV linear actuating cylinders in both directions.

c. Ensure main fuel control pulley follows stator synchronizing arm movement with no observable hesitation during cylinder actuation in both directions.

CAUTION

RCVV linear actuating cylinders shall be moved to extend position to prevent overtemperature on engine start.

d. Using PWA 50096 hydraulic pressure cart, apply 100 to 250 psig maximum pressure to position RCVV linear actuating cylinders in extended position.

6. REMOVE HYDRAULIC PRESSURE TOOLING FROM ENGINE.
(See Figure 3.)

a. Disconnect PWA 50096 hydraulic pressure cart from PWA 57102 and PWA 571003 adapters(7 and 8, figure 3).

b. Disconnect PWA 57102(7) and PWA 57103(8) adapters from RCVV linear actuating cylinder test fittings(1 and 2).

c. Lubricate MS9966-04 packings(3 and 6) using MIL-L-7808 oil or VV-P-236 petrolatum.

d. Install packings(3 and 6) using MIL-L-7808 oil or VV-P-236 petrolatum.

e. Lubricate threads of plugs(4 and 5) using PWA 550 antigalling compound.

f. Thread plugs(4 and 5) into test fittings(1 and 2) handtight.

g. Lockwire plugs(4 and 5) using PN MS9226-04 wire.

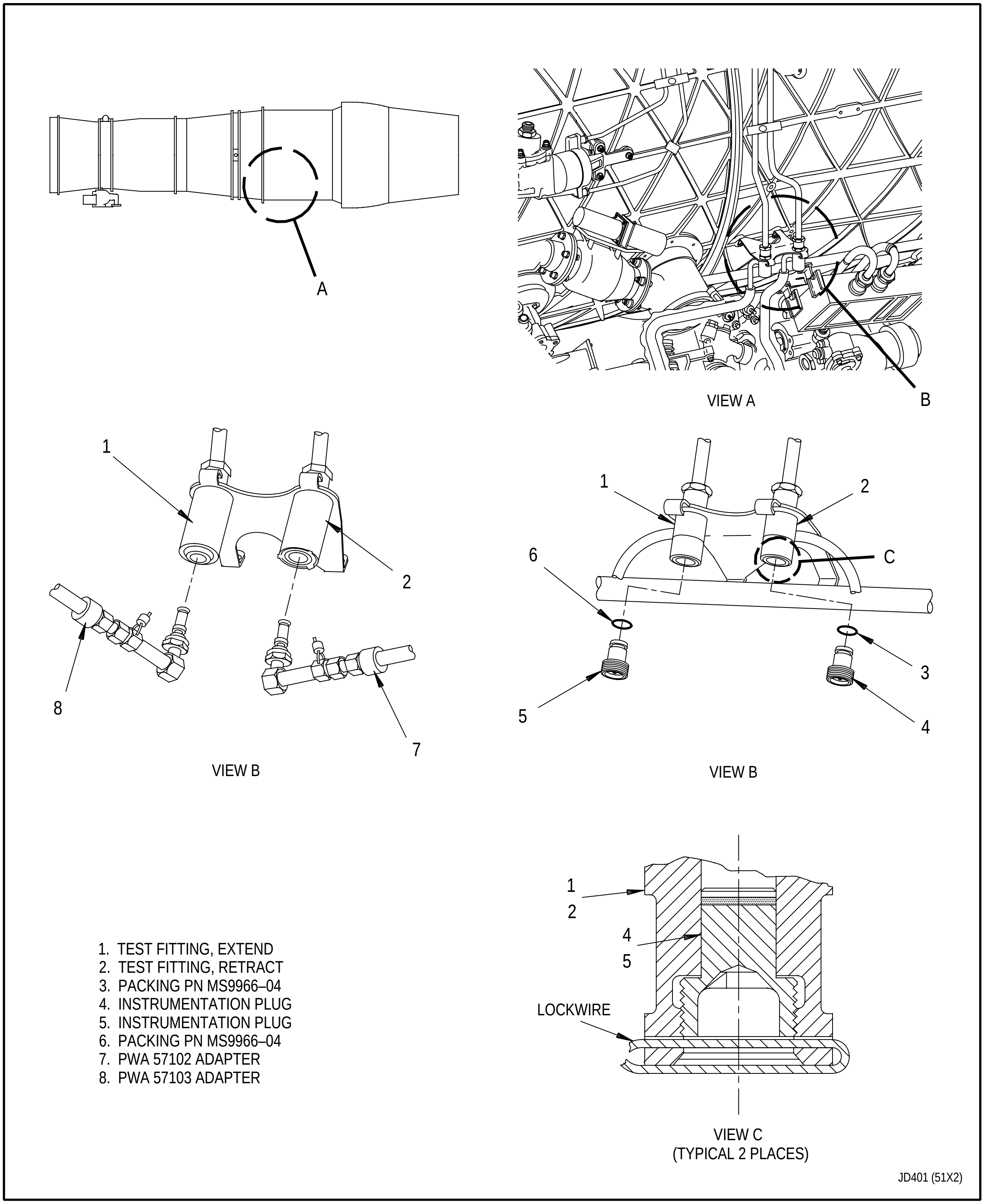


Figure 3. Removing Hydraulic Pressure Tooling From Engine

WORK PACKAGE

TECHNICAL PROCEDURES

CONTROL SYSTEM - EXHAUST NOZZLE, CONVERGENT -

RIGGING CHECK AND RIGGING

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 12

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	16	5	16	6 - 12	14
2 - 4	14				

REFERENCE MATERIAL REQUIRED

None

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Compound, antigalling (PWA 36545)	Everlube 382
Lockwire (0.020 inch diameter)	MS9226-02
Lockwire (0.032 inch diameter)	MS9226-04
Oil, lubricating	MIL-L-7808

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Cotter pin	MS9245-28	2

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains instructions for a rigging check and rigging of the convergent exhaust nozzle control (CENC) system.

2. CONVERGENT EXHAUST NOZZLE CONTROL SYSTEM - RIGGING CHECK AND RIGGING.

(See Figures 1 through 5.)

NOTE

- If a check is required of the previously rigged systems, perform steps a., c., and d.
- For complete rigging of the CENC system perform all the following steps.

a. Remove right primary actuator flexible shaft(2, figure 1) as follows:

(1) Remove bolts(6).

(2) Loosen jamnut(10) and slide the actuator input shaft dust cover(9) back onto shaft(2) to expose T-shaped cotter pin(8).

(3) Remove and discard cotter pin(8).

(4) Loosen outer casing(3).

(5) Slide outer casing(3) back over shaft(2).

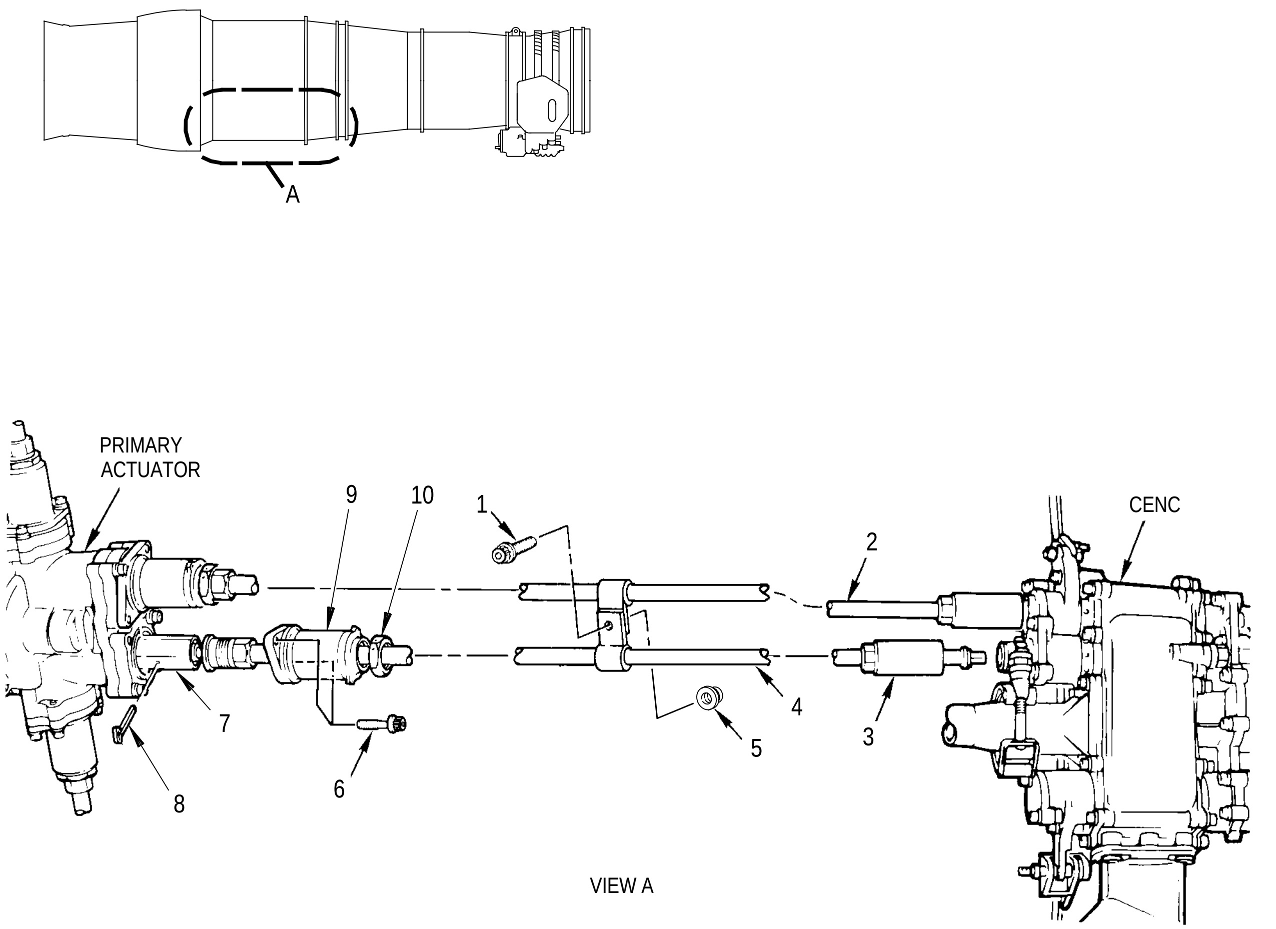
(6) Remove nut(5) and bolt(1) from clamp, if required.

(7) Slide spline coupling(7) away from primary actuator to disengage and remove right primary actuator flexible shaft(2).

NOTE

- If previously rigged system requires only inspection, proceed to step c.
- If performing complete rigging of the CENC to nozzle, continue with step b.

b. Repeat step a. (1 through 7) to remove left primary actuator flexible shaft(4).



Index numbers apply to both left and right primary actuator flexible shafts.

1. Bolt
2. Right primary actuator flexible shaft
3. Outer casing
4. Left primary actuator flexible shaft
5. Nut
6. Bolt
7. Spline coupling
8. Cotter pin (PN MS9245-28)
9. Dust cover, actuator input shaft
10. Jamnut

Figure 1. Left and Right Primary Actuator Flexible Shaft - Removal

c. Preset primary convergent nozzle actuator as follows:

(1) Insert locally manufactured speed wrench adapter onto right primary actuator input spline. See figure 2.

CAUTION

Torque shall not exceed 25 pound-inches after contact with hard stops. Damage to equipment may result.

(2) Turn wrench until actuators contact retracted hard stops and nozzle is in full open position. Do not exceed 25 pound-inches torque.

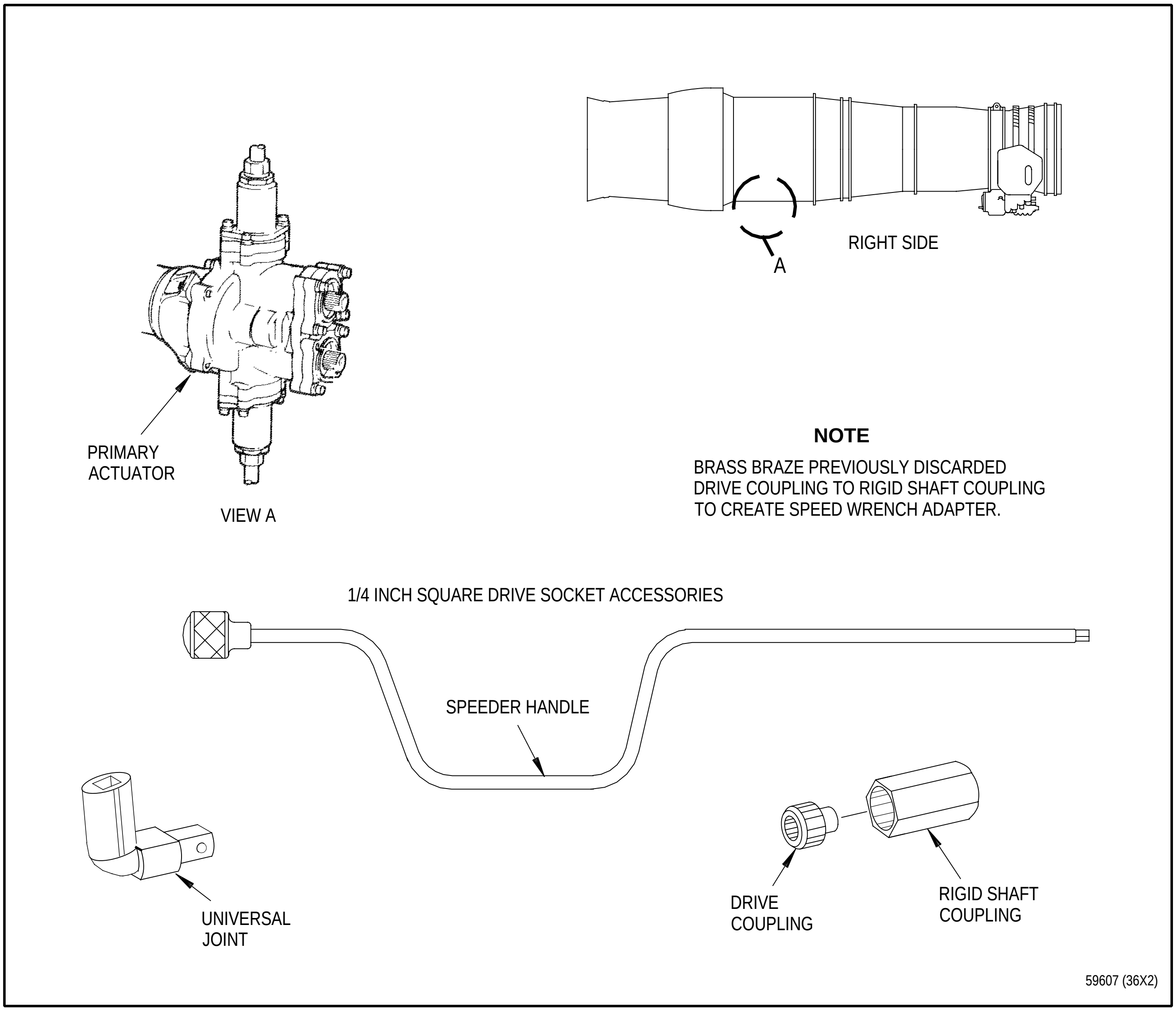


Figure 2. Primary Nozzle Actuator Preset Position

d. Ensure proper CENC to primary actuator rigging as follows:

(1) View rig point counter on CENC. (See figure 3.)

(2) If counter reads 500, CENC is properly rigged to primary actuator. Proceed to step f. to install primary actuator flexible shafts.

(3) If counter does not read 500, CENC is not properly rigged to primary actuator. Proceed as follows:

(a) If not previously accomplished, remove left primary actuator flexible shaft per step b.

(b) Preset CENC per step e.

e. Preset CENC as follows:

NOTE

CENC rotor may bind when one air motor drive is rotated while setting CENC rig indicator. This binding is normal if rotating the other air motor drive in the opposite direction eliminates binding.

(1) If rig point counter reads more than 500, rotate CENC outboard rotor clockwise (looking forward) until counter reads 500.

(2) If rig point counter reads less than 500, rotate CENC outboard rotor counterclockwise (looking forward) until counter reads 500.

(3) Set exhaust nozzle position transmitter per step f.

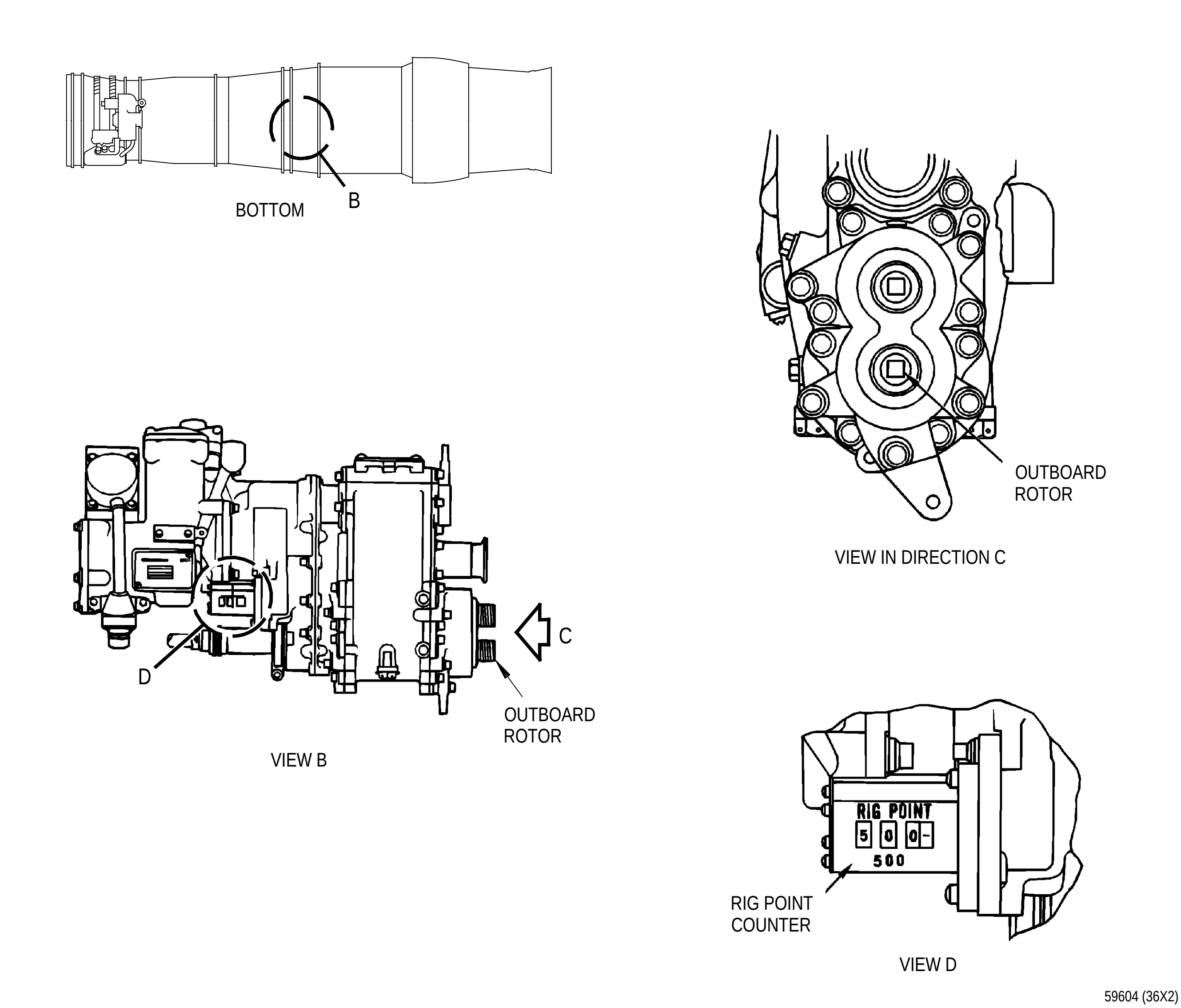


Figure 3. Convergent Exhaust Nozzle Control Preset Position

f. Set nozzle position transmitter (ENPT)(2, figure 4) to preset position as follows:

(1) Check position of rotating white line(7). If rotating white line is centered with stationary white index mark(1), ENPT is in preset position. Proceed to step g.

(2) If red or green band is positioned under stationary index mark, remove ENPT and set to preset position as follows:

(3) Disconnect cable connector(4) from position transmitter.

(4) Remove nut(6) and bolt(3) from ENPT clamp.

(5) Rotate clamp so cut-out in rear of clamp is over section of transmitter flange between scallop cuts.

(6) Spread clamp until transmitter flange is uncovered. Remove ENPT. Do not remove clamp from control flange.

(7) Install protective closure on control if not immediately reinstalling ENPT.

(8) If red band is positioned under index mark(1), rotate gear(5) clockwise (facing gear) until rotating white line(7) is centered with index mark(1).

(9) If green band is positioned under index mark(1), rotate gear(5) counterclockwise (facing gear) until rotating white line(7) is centered with index mark(1).

(10) Align slot in transmitter flange with pin in control flange.

(11) Rotate clamp so cut-out in rear of clamp is over section of transmitter flange between scallop cuts.

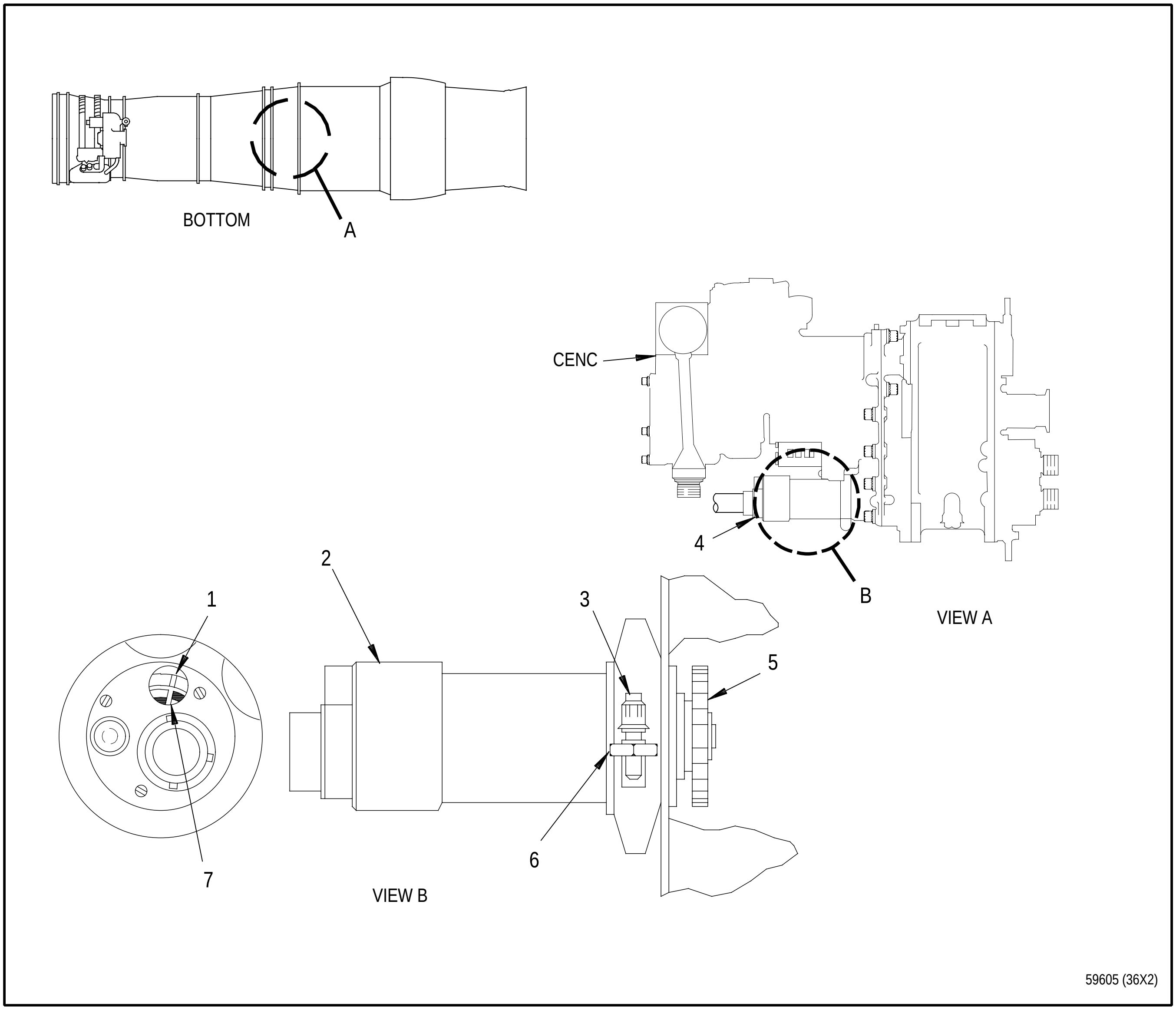
(12) Spread clamp and insert transmitter flange in clamp against control flange. Ensure aligning slot and pin are engaged.

(13) Rotate clamp so cut-out aligns with scallop cut in transmitter flange. Secure clamp on flanges with bolt(3) and nut(6). Torque nut(6) 10 to 15 pound-inches. Lockwire bolt with PN MS9226-04 wire.

NOTE

Bayonet connectors should not be shaken for looseness check as with threaded connectors.

(14) Remove protective closure from J7 receptacle. Connect P7 cable to J7 on ENPT by pushing connector into receptacle and turning knurled ring clockwise until ring snaps into place.



1. White index mark (stationary)
2. Exhaust nozzle position transmitter (ENPT)
3. Bolt
4. Cable connector P7
5. Gear
6. Nut
7. White line (rotating)

Figure 4. Exhaust Nozzle Position Transmitter (ENPT) Preset Position

g. Install left primary actuator flexible shaft(5, figure 5) and right primary actuator flexible shaft(2) as follows:

NOTE

- Primary convergent actuator is in preset position when actuators are contacting their retracted hard stops and nozzle is in full open position.
- CENC is in preset position when rig point counter reads 500.

(1) Ensure primary actuator is in preset position per step c.

(2) Ensure CENC is in preset position per step e.

NOTE

Do not rotate driveshaft on CENC or primary actuator out of preset position.

(3) Insert square drive end(3) of left primary actuator flexible shaft(5) into square drive hole of CENC.

(4) Engage outer casing(4) around CENC output fingertight.

(5) Connect opposite end of primary actuator flexible shaft to primary actuator by aligning and engaging spline coupling(8) with actuator drive splines.

(6) Flatten head of cotter pin(9) into t-shape. Install pin through hole in coupling(8) and bend ends closely around coupling(8).

(7) Slide actuator input shaft dust cover(10) over splined coupling(8) and position against primary nozzle actuator. Install bolts(7) fingertight.

(8) Install jamnut(11) and outer casing(4) finger tight to allow for alignment before primary flexible shafts are torqued.

(9) Torque outer casing(4) 35 to 40 pound-inches. Lockwire casing using PN MS9226-02 wire.

(10) Torque bolts(7) 12.5 to 16 pound-inches. Lockwire bolts using PN MS9226-02 lockwire.

(11) Torque jamnut(11) 35 to 40 pound-inches. Lockwire jamnut using PN MS9226-02 wire.

(12) Install right primary actuator flexible shaft per substeps (1) through (11). Install bolt(1) and nut (6).

(13) Lockwire left and right outer casings(4) together using PN MS9226-02 wire.

(14) Torque bolt(1) and nut(6) 32 to 36 pound-inches.

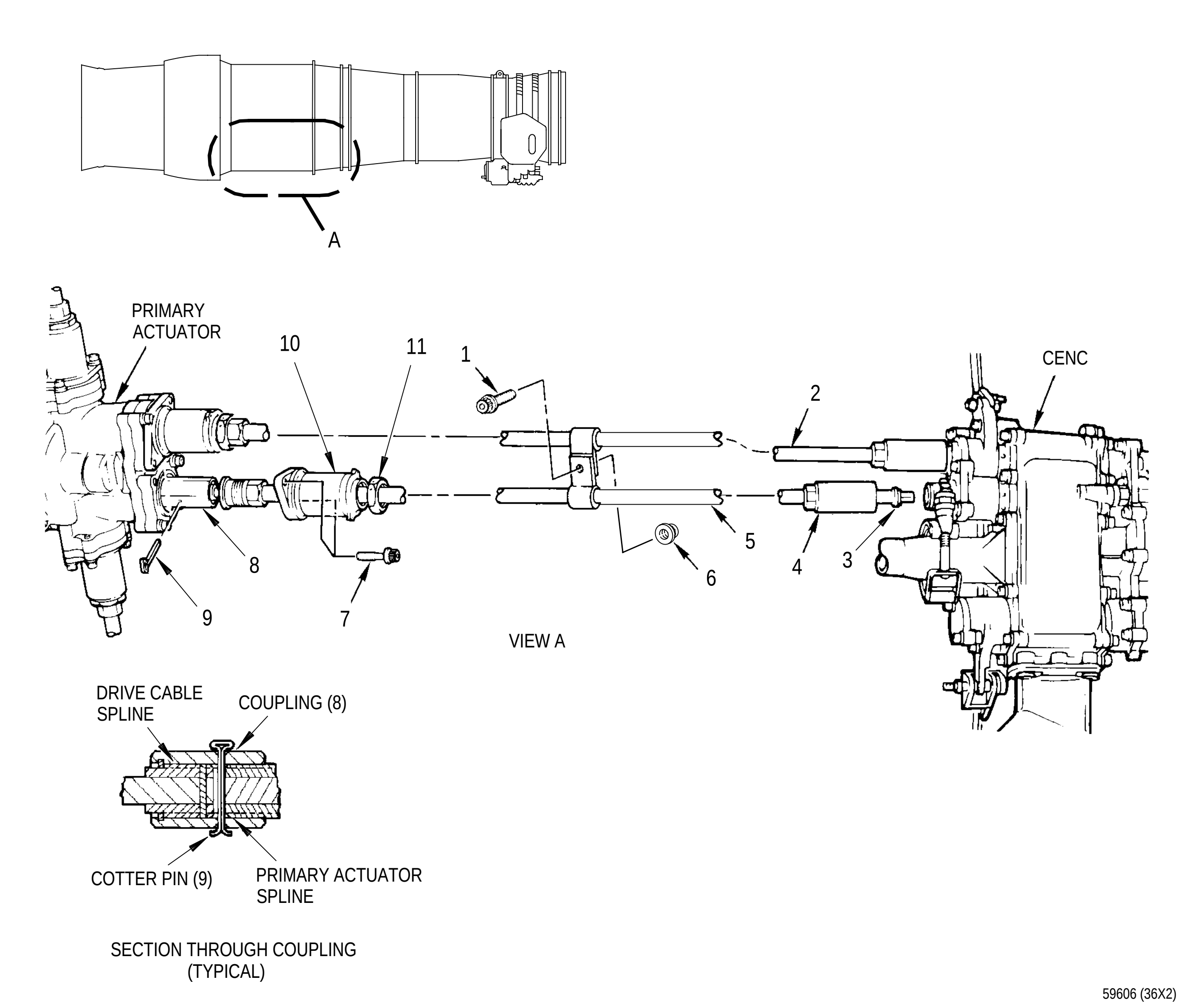


Figure 5. Left and Right Primary Actuator Flexible Shaft - Installation

Legend for figure 5

Index Number	Description	Lubricant	Torque pound-inches	Lockwire PN
	NOTE Index numbers apply to both left and right primary actuator flexible shafts.			
1	Bolt			
2	Right primary actuator flexible shaft			
3	Square drive			
4	Outer casing		35 to 40	MS9226-02
5	Left primary actuator flexible shaft			
6	Nut	PWA 36545	32 to 36	
7	Bolt	MIL-L-7808	12.5 to 16	MS9226-02
8	Splined coupling, primary actuator			
9	Cotter pin PN MS9245-28			
10	Dust cover, actuator input shaft			
11	Jamnut	PWA 36545	35 to 40	MS9226-02

WORK PACKAGE

TECHNICAL PROCEDURES

REAR COMPRESSOR
VARIABLE VANE INTERNAL RIGGING CHECK

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 10

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 9	24	10 Blank	24		

REFERENCE MATERIAL REQUIRED

Title	Number
Engine Accessories and Rigging Procedures	T.O. 2J-F100-53-4
Cylinder - Actuating, Linear, Variable Vane, Rear Compressor - Rigging	WP 101 00
Maintenance Instructions	T.O. 2J-F100-53-5
Borescope/Fibrescope Inspection - Equipment and Operation	WP 021 00
Hydraulic Pressure Tester PWA 50096	T.O. 33D4-6-617-1

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
COMPOUND, ANTIGALLING, (PWA 550)	HI-T-650 OR LUBRI-BOND HT
LOCKWIRE(0.032 INCH DIAMETER)	MS9226-04
OIL, LUBRICATING, JET ENGINE (PMC 9852)	MIL-L-6081 (GRADE 1010)
OIL, LUBRICATING	MIL-L-7808
PETROLATUM	VV-P-236

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
PACKING, PREFORMED	MS9966-04	2

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
2	HYDRAULIC PRESSURE TOOLING - INSTALLATION	
	ADAPTER, RETRACT FITTING	PWA 57102
	ADAPTER, EXTEND FITTING	PWA 57103
	CART, HYDRAULIC PRESURE	PWA 50096
3	RCVV INTERNAL RIGGING - BORESCOPE INSPECTION	
	GUIDE TUBE	LM 1034
	MAINTENANCE KIT, AIRCRAFT ENGINE FLEXIBLE BORESCOPE	PWA 56075
	CART, HYDRAULIC PRESURE	PWA 50096
4	HYDRAULIC PRESSURE TOOLING - REMOVAL	
	CART, HYDRAULIC PRESURE	PWA 50096
	ADAPTER, RETRACT FITTING	PWA 57102
	ADAPTER, EXTEND FITTING	PWA 57103

ILLUSTRATED SUPPORT EQUIPMENT

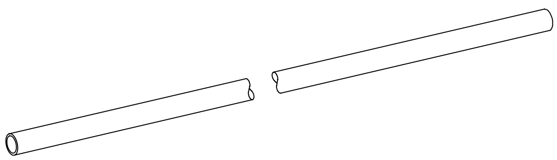


Figure T1. LM 1034 GUIDE TUBE

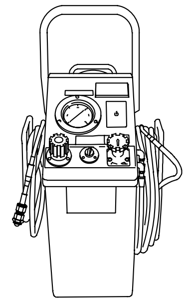


Figure T2. PWA 50096 CART

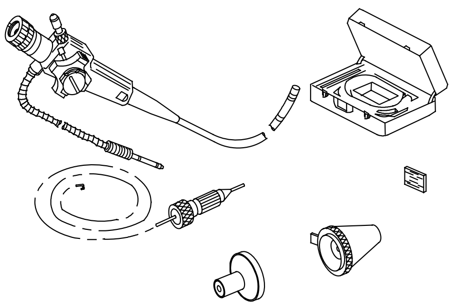


Figure T3. PWA 56075 MAINTENANCE KIT

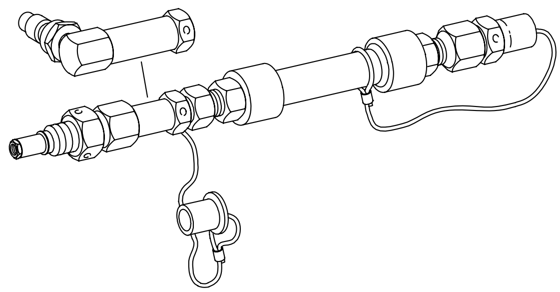


Figure T4. PWA 57102 ADAPTER

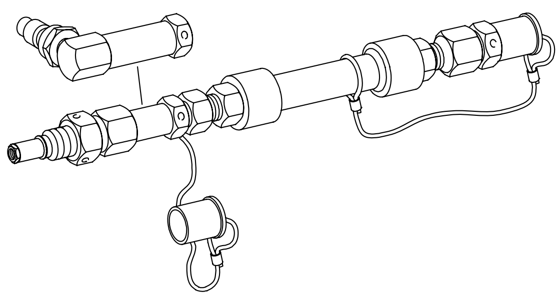


Figure T5. PWA 57103 ADAPTER

1. INTRODUCTION.

a. This work package contains instructions for borescope inspection of RCVV internal rigging after the external actuators are rigged.

2. HYDRAULIC PRESSURE TOOLING - INSTALLATION.

(See Figure 1.)

a. Verify the RCVVs were rigged. If cylinders were not rigged, refer to WP 101 00.

b. Remove safety wire, two instrumentation plugs(4 and 5, figure 1) and two packings(3,6) from retract and external fittings. Discard packings.

c. Install PWA 57102 retract adapter(7) in retract fitting.

d. Install PWA 57103 extend adapter(8) in extend fitting.

e. Connect PWA 50096 hydraulic pressure cart retract hose assembly to PWA 57102 retract adapter.

f. Connect PWA 50096 hydraulic pressure cart extend hose assembly to PWA 57103 extend adapter.

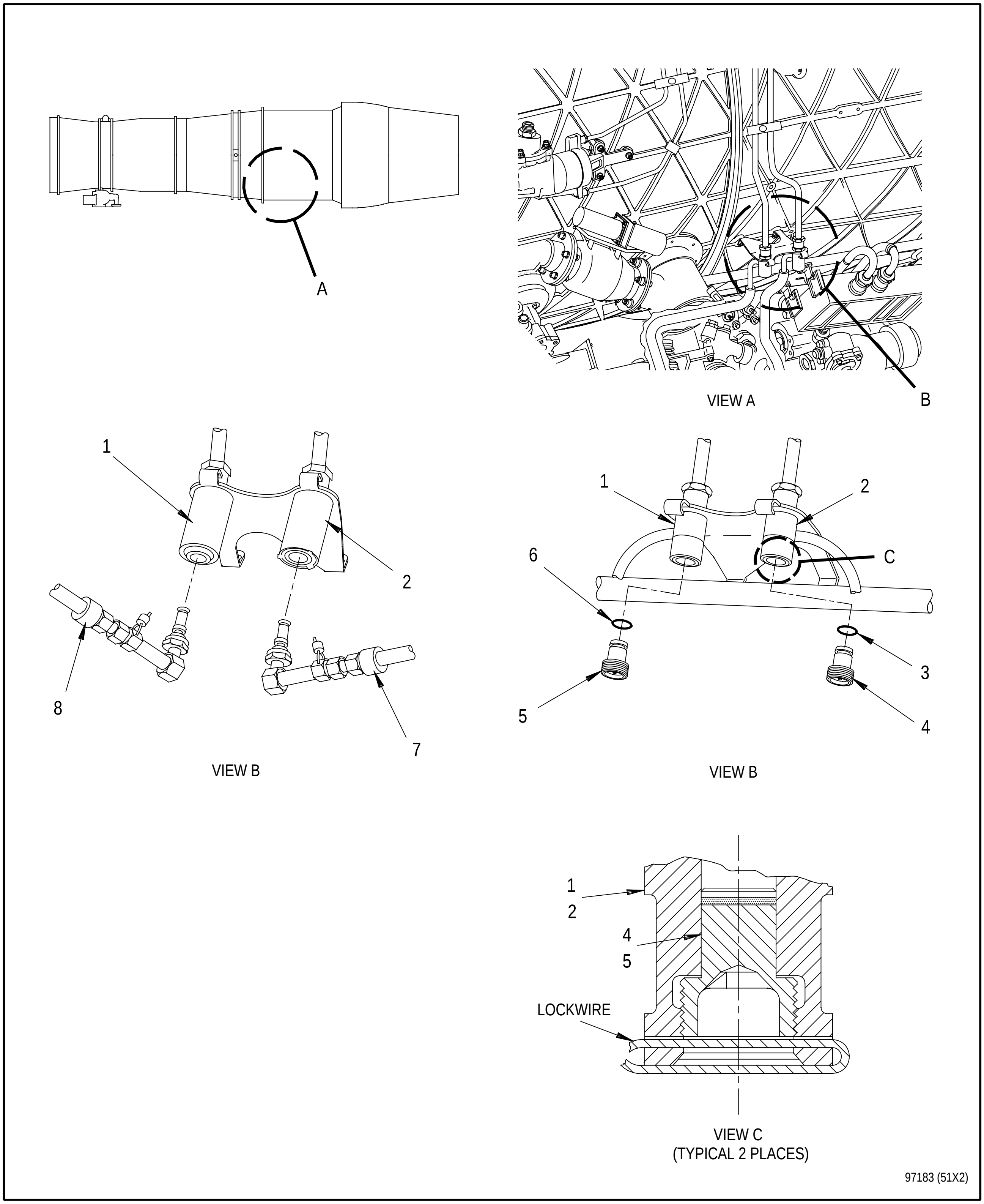


Figure 1. Hydraulic Pressure Tooling - Installation/Removal

Legend for figure 1

1. Test fitting, extend
2. Test fitting, retract
3. Packing PN MS9966-04
4. Instrumentation plug
5. Instrumentation plug
6. Packing PN MS9966-04
7. PWA 57102 Retract adapter
8. PWA 57103 Extend adapter

3. RCVV INTERNAL RIGGING - BORESCOPE INSPECTION.
(See Figure 2.)

a. Insert LM 1034 guide tube through augmentor duct and into fan duct at 3:30 o'clock position.

b. Place borescope from PWA 56075 maintenance kit inside LM 1034 guide tube. Ensure tools will not interfere with RCVV movement.

CAUTION

Exceeding pressure of 250 psig on test equipment may cause damage to cylinders.

NOTE

- Refer to T.O. 33D4-6-617-1 for operating instructions for PWA 50096 hydraulic pressure cart.
- Ensure hydraulic pressure cart is filled with lubricating oil MIL-L-6081 grade 1010.

c. Using PWA 50096 hydraulic pressure cart, apply 200-250 psig pressure to RCVV actuators. Cycle from retract to extend position three times and hold in retract position.

NOTE

Borescope tip must be positioned as close as possible to stop screw/pump handle edge to determine if a gap exists. View angle should be approximately 90 degrees to the stop screw.

d. Using borescope, verify RCVV pump handle contacts axial stop screw. See figure 2. If pump handle does not contact axial stop screw, refer to WP 101 00.

e. Ensure tools will not interfere with RCVV movement. Extend actuators using hydraulic pressure cart and verify position of RCVV pump handle. If pump handle contacts the cambered stop screw, refer to WP 101 00.

f. Remove borescope and guide tube from 3:30 position and insert at 9:30 position. Ensure tools will not interfere with RCVV movement.

g. Repeat steps c through e, then complete step h.

h. Remove tools from engine. Ensure RCVV linear actuating cylinders are left in extended position.

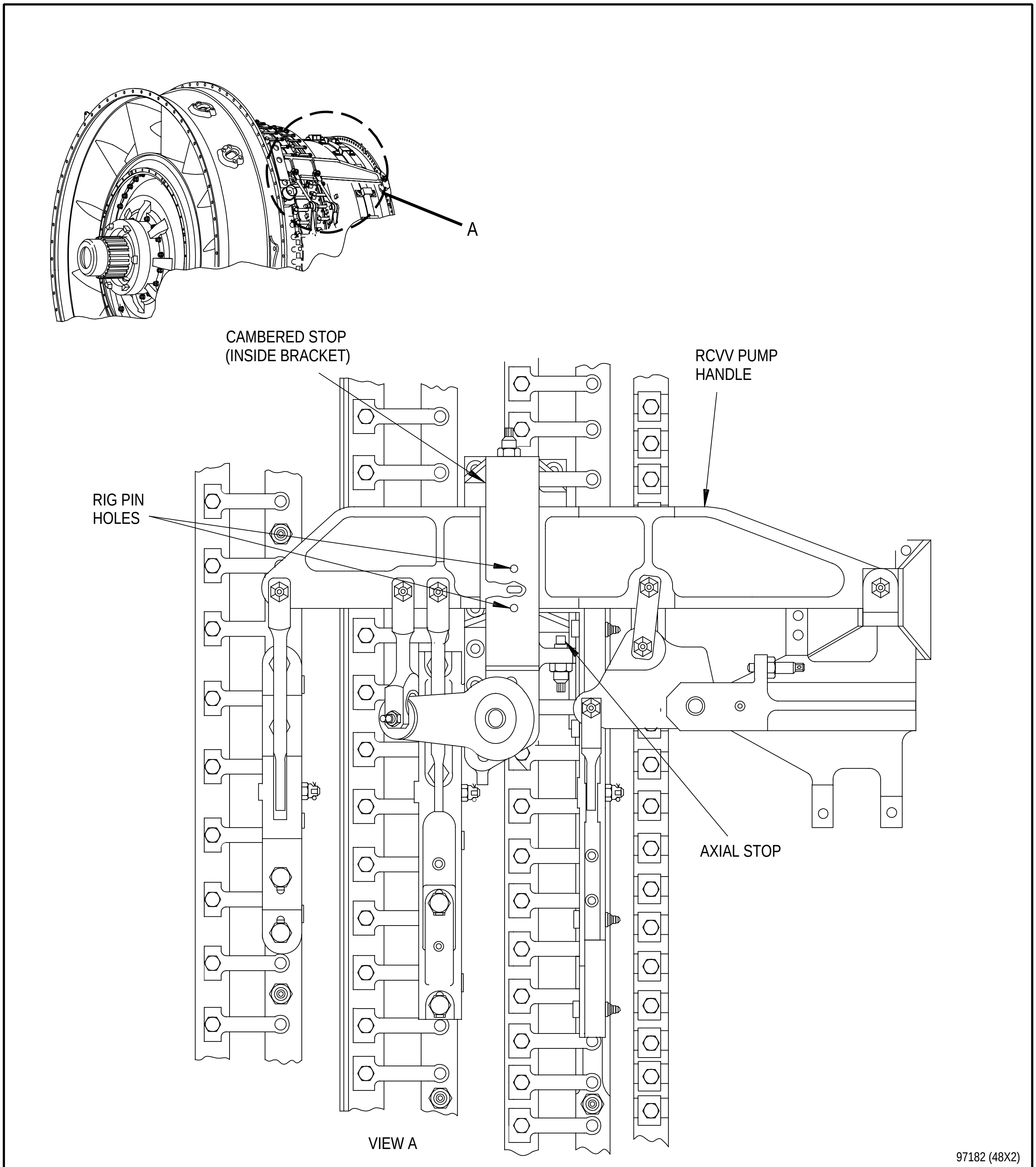


Figure 2. RCVV Internal Rigging Borescope Inspection

4. HYDRAULIC PRESSURE TOOLING - REMOVAL.
(See Figure 1.)

a. Disconnect PWA 50096 hydraulic pressure cart from PWA 57102 and PWA 571003 adapters (7 and 8, figure 1).

b. Disconnect PWA 57102(7) and PWA 57103(8) adapters from RCVV linear actuating cylinder test fittings(1 and 2).

c. Lubricate MS9966-04 packings (3 and 6) using MIL-L-7808 oil or VV-P-236 petrolatum.

d. Install packings(3 and 6).

e. Lubricate threads of plugs (4 and 5) using PWA 550 antigalling compound.

f. Thread plugs(4 and 5) into test fittings(1 and 2) handtight.

g. Lockwire plugs(4 and 5) using PN MS9226-04 wire.

WORK PACKAGE

TECHNICAL PROCEDURES

TABLE OF LIMITS AND CLEARANCE CHARTS

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 22

REFERENCE MATERIAL REQUIRED

None

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains dimensional limits, spring pressures, and special torque values for engine external accessories, tube assemblies, and electrical cables for which special fits, torques, and spring pressures are required.

2. GENERAL.

(See FO-1.)

a. Reference numbers on illustrations indicate location of fits, clearances, and parts for which special torque and spring pressures are specified. Description of, and limits for these fits, clearances, backlashes, torques, and spring pressures are located in tables by corresponding reference numbers.

3. LIMITS.

a. All Minimum and Maximum dimensions in the limits column are blueprint limits and have not had Replace If Over tolerances added. Replace If Over tolerances, when determined, will be added to this manual in subsequent changes.

4. TERMS AND SYMBOLS.

a. Symbol T in Minimum and Maximum in Tables of Limits column indicates tight fit.

b. Unless otherwise specified, all fits are diametrical, except spline fits which are calculated from chordal dimensions.

c. Letter-number codes enclosed within a circle on limits charts, such as A12, are of contractor significance only and shall be ignored.

d. Letter-number codes within parentheses, such as (C-8), relate to coordinates on the outer margins of each clearance chart to facilitate location.

5. UNITS.

a. Figures in Minimum and Maximum columns in Tables of Limits shall be interpreted as follows: Torque in pound-inches, spring pressure in pounds, and all other limits in inches.

Table 1. Engine External Parts - Fits and Clearances (See FO-1.)

Ref No.	Name	Dimensions for Ref		Limits	
		Min	Max	Min	Max
1601	Compressor Stator				
	Cylinder Bolt - - - - - - - - - - - - - - -	.2460	.2490		
	Support - - - - - - - - - - - - - - - - - - -	.2495	.2515	.0005	.0055
1602	Compressor Stator				
	Linkage Arm - - - - - - - - - - - - - - - -	1.0380	1.0400		
	Bearing - - - - - - - - - - - - - - - - - - -	1.0405	1.0420	.0005	.004
1603	Compressor Stator				
	Linkage Bolt - - - - - - - - - - - - - - - -	.1883	.1893		
	Bearing - - - - - - - - - - - - - - - - - - -	.1895	1.900	.0002	.0017
1604	Compressor Stator				
	Linkage Bolt - - - - - - - - - - - - - - - -	.1883	.1893		
	Rod End Clevis - - - - - - - - - - - - - -	.1905	.1925	.0012	.0042
1605	Side Clearance				
	Compressor Stator				
	Linkage Arm Bearing - - - - - - - - - - -	.279	.281		
	Rod End Clevis - - - - - - - - - - - - - -	.282	.287	.001	.008
1606	Compressor Stator				
	Linkage Arm Bearing - - - - - - - - - - -	1.563	1.564		
	Outer Front Fan Duct - - - - - - - - - -	1.564	1.566	.000	.003
1607	Compressor Stator				
	Linkage Arm Bearing - - - - - - - - - - -	.5620	.5625		
	Arm -	.5622	.5628	.0008	.0003T
1609	Compressor Stator				
	Linkage Bolt - - - - - - - - - - - - - - - -	.2483	.2493		
	Arm -	.2495	.2500	.0002	.0017
1610	Compressor Stator				
	Linkage Bolt - - - - - - - - - - - - - - - -	.2483	.2493		
	Rod End Clevis - - - - - - - - - - - - - -	.2495	.2500	.002	.0017
1611	Side Clearance Compressor Stator				
	Linkage Arm Bearing - - - - - - - - - - -	.341	.343		
	Rod End Clevis - - - - - - - - - - - - - -	.344	.346	.001	.005

Table 1. Engine External Parts - Fits and Clearances (See FO-1.) (continued)

Ref No.	Name	Dimensions for Ref		Limits	
		Min	Max	Min	Max
1612	Compressor Stator				
	Linkage Arm Bearing -----------	.6557	.6562		
	Arm ----------------------	.6560	.6565	.0008	.0002T
1636	Bleed Valve Strap				
	Cylinder Support -------------	4.815	4.817		
	Outer Front Fan Duct ----------	4.818	4.822	.001	.007
1638	Oil Cooler Support				
	Bolt --------------------	.278	.279		
	Oil Cooler Support ------------	.280	.282	.001	.004
1639	Oil Cooler Support				
	Bolt --------------------	.278	.279		
	Oil Cooler Arm --------------	.280	.282	.001	.004
1642	Side Clearance				
	Oil Cooler Arm --------------	.308	.312		
	Oil Cooler Support ------------	.316	.320	.004	.012
1644	Oil Cooler Bolt --------------	.250	.251		
	Oil Cooler Bushing ------------	.252	.254	.001	.004
1647	Convergent Exhaust				
	Nozzle Control Bolt -----------	.1870	.1880		
	Bearing ------------------	.1895	.1900	.0015	.0030
1650	Convergent Exhaust				
	Nozzle Control Bolt -----------	.187	.188		
	Bushing ------------------	.190	.191	.002	.004
1652	Convergent Exhaust				
	Nozzle Control Bolt -----------	.165	.175		
	Bracket ------------------	.1895	.1905	.0145	.0255

Table 1. Engine External Parts - Fits and Clearances (See FO-1.) (continued)

Ref No.	Name	Dimensions for Ref		Limits	
		Min	Max	Min	Max
1654	Convergent Exhaust Nozzle Control Bolt				
	(Major Diameter) - - - - - - - - - - - - -	.184	.190		
	Bearing - - - - - - - - - - - - - - - - - -	.1895	.190	.0005T	.0060
1657	Convergent Exhaust Nozzle Control				
	Spacer - - - - - - - - - - - - - - - - - - -	.3592	.3608		
	Bracket - - - - - - - - - - - - - - - - - -	.3610	.3630	.0002	.0038
1659	Convergent Exhaust				
	Nozzle Control Bolt - - - - - - - - - - -	.187	.188		
	Spacer - - - - - - - - - - - - - - - - - - -	.192	.193	.004	.006
1668	Side Clearance				
	Seal Ring - - - - - - - - - - - - - - - - -	.1245	.1255		
	Bleed Valve Strap				
	Cylinder Support - - - - - - - - - - - - -	.1265	.1285	.0010	.0040
1669	Gap				
	Seal Ring At				
	4.822 BSC - - - - - - - - - - - - - - - - -	.022	.042		
	Outer Front Fan Duct - - - - - - - - - -	4.818	4.822	.009	.042
1690	Augmentor				
	Igniter Plug - - - - - - - - - - - - - - - -	1.004	1.005		
	Convex Washer - - - - - - - - - - - - - - -	1.006	1.010	.001	.006
1691	Augmentor				
	Igniter Plug - - - - - - - - - - - - - - - -	.498	.502		
	Ball Socket Seat - - - - - - - - - - - - -	.495	.497	.001T	.007T
1694	Side Clearance				
	Compressor Stator				
	Cylinder Bolt - - - - - - - - - - - - - - -	.278	.280		
	Rear Compressor				
	Linear, Variable Vane				
	Actuating Cylinder - - - - - - - - - - - -	.281	.282	.001	.004
1695	Compressor Stator				
	Cylinder Bolt - - - - - - - - - - - - - - -	.2460	.2490		
	Bearing - - - - - - - - - - - - - - - - - -	.2495	.2500	.0005	.0040

Table 1. Engine External Parts - Fits and Clearances (See FO-1.) (continued)

Ref No.	Name	Dimensions for Ref		Limits	
		Min	Max	Min	Max
1696	Exhaust Nozzle Convergent				
	Control Bushing - - - - - - - - - - - - - -	.3715	.3735		
	Lug -	.3740	.3750	.0005	.0035
1704	Convergent Exhaust				
	Nozzle Control Bolt - - - - - - - - - - - -	.187	.188		
	Lug -	.190	.191	.001	.004
1706	Convergent Exhaust Nozzle				
	Control Bolt - - - - - - - - - - - - - - - -	.187	.188		
	Bushing - - - - - - - - - - - - - - - - - - -	.190	.191	.002	.004
1726	Seal Ring Transfer Tube - - - - - - - - -	3.486	3.487		
	Diffuser Case - - - - - - - - - - - - - - - -	3.500	3.501	.013	.015
1733	Side Clearance				
	Augmentor Fuel Pump				
	Air Vent Manifold Sleeve - - - - - - - - -	.096	.100		
	Seat-Sleeve Retaining Plate - - - - - -	.108	.110	.008	.014
1734	Gap				
	Augmentor Fuel Pump				
	Air Vent Manifold				
	Seal Ring Gap at 3.365 BSC - - - - - -	.006	.018		
	Sleeve -	3.365	3.369	.006	.031
1735	Gap				
	Augmentor Fuel Pump Air				
	Vent Manifold Seal Ring				
	Gap at 4.376 BSC - - - - - - - - - - - - - -	.030	.040		
	Seal -	4.376	4.381	.030	.056
1736	Side Clearance				
	Augmentor Fuel Pump				
	Air Vent Manifold Tube				
	Seal Ring - - - - - - - - - - - - - - - - - -	.0925	.0935		
	Tube -	.0950	.0970	.0015	.0045
1737	Gap				
	Augmentor Fuel Pump				
	Air Supply Expansion				
	Joint Seal Ring Gap				
	At 3.500 BSC - - - - - - - - - - - - - - - - -	.015	.040		
	Diffuser Case - - - - - - - - - - - - - - - -	3.500	3.502	.015	.044

Table 1. Engine External Parts - Fits and Clearances (See FO-1.) (continued)

Ref No.	Name	Dimensions for Ref		Limits	
		Min	Max	Min	Max
1738	Gap Augmentor Fuel Pump Air Supply Manifold Tee Seal Ring Gap At 4.000 BSC - - - - - - - - - - - - - - - - - Forward Outer Fan Duct - - - - - - - - -	 .015 4.000	 .040 4.002	 .015	 .046
1739	Seal Ring - - - - - - - - - - - - - - - - - - - Transfer Tube - - - - - - - - - - - - - - - -	.154 .156	.155 .158	 .001	 .004
1740	Gap Augmentor Fuel Pump Air Supply Expansion Joint Seal Ring Gap At 3.500 BSC - - - - - - - - - - - - - - - - - - - Tee -	 .015 3.500	 .040 3.501	 .015	 .043
1741	Side Clearance Seal Ring - - - - - - - - - - - - - - - - - - - Augmentor Fuel Pump Air Supply Manifold Tee - - - - - - - -	 .154 .156	 .155 .158	 .001	 .004
1742	Side Clearance Augmentor Fuel Pump Air Supply Manifold Tee - - - - - - - - Outer Front Fan Duct - - - - - - - - - - -	 .310 .333	 .315 .337	 .018	 .027
1743	Augmentor Fuel Pump Air Supply Manifold Tee - - - - - - - - - - - - Grooved Clamp Coupling Cover -	 3.310 3.336	 3.313 3.339	 .023	 .029
1744	Side Clearance Grooved Clamp Coupling Cover - Augmentor Fuel Pump Air Supply Manifold Tee - - - - - - - - - - - -	 .138 .142	 .142 .146	 .000	 .008
1745	Gap At Zero Torque Packing Transfer Tube - - - - - - - - - - - No. 4 Bearing Tube Lock Plate -	 .115 .109	 .120 .114	 .001	 .011

Table 1. Engine External Parts - Fits and Clearances (See FO-1.) (continued)

Ref No.	Name	Dimensions for Ref		Limits	
		Min	Max	Min	Max
1746	Gap At Zero Torque				
	No. 4 Bearing Adapter ----------	.110	.115		
	Tube Lock Plate ---------------	.104	.109	.001	.011
1747	Air Supply Manifold Support				
	Rod ---------------------	.446	.447		
	Ball End ------------------	.448	.449	.001	.003
1748	Augmentor Fuel Pump Air				
	Supply Manifold Tee -----------	3.982	3.985		
	Forward Outer Fan Duct ---------	4.000	4.002	.015	.020
1749	Seal Ring Transfer Tube --------	3.486	3.487		
	Augmentor Fuel Pump Air				
	Supply Manifold Tee -----------	3.500	3.502	.013	.016
1750	Compressor Stator ------------	.5620	.5622		
	Linkage Arm Bearing -----------	.5627	.5632	.0005	.0012
	Link				
1763	Main Fuel Control				
	Mounting Lug ----------------	.310	.312		
	Bolt --------------------	.307	.308	.002	.005
1764	Rear Fan Duct				
	Mount Lug ------------------	.310	.312		
	Main Fuel Control Bolt ---------	.307	.308	.002	.005
1766	Main Fuel Control				
	Mounting Lug ----------------	.310	.312		
	Bolt --------------------	.307	.308	.002	.005
1767	Rear Fan Duct				
	Mount Lug ------------------	.310	.312		
	Main Fuel Control Bolt ---------	.307	.308	.002	.005
1769	Main Fuel Control				
	Bushing ------------------	.2505	.2525		
	Bolt --------------------	.2460	.2470	.0035	.0065

Table 1. Engine External Parts - Fits and Clearances (See FO-1.) (continued)

Ref No.	Name	Dimensions for Ref Min	Dimensions for Ref Max	Limits Min	Limits Max
1770	Main Fuel Control				
	Link Bearing - - - - - - - - - - - - - - - - -	.2495	.2500		
	Bolt -	.2460	.2470	.0025	.0040
1771	Main Fuel Control				
	Rear Mount Bushing - - - - - - - - - - - - -	.250	.252		
	Bolt -	.246	.247	.003	.006
1772	Main Fuel Control				
	Rear Link Bearing - - - - - - - - - - - - -	.250	.252		
	Bolt -	.246	.247	.003	.006
1773	Main Fuel Control				
	Bracket -	.3365	.3375		
	Bushing OD - - - - - - - - - - - - - - - - - -	.3380	.3385	.0005T	.0020T
1774	Main Fuel Pump				
	Rear Mount Lug Bushing - - - - - - - - - -	.3124	.3140		
	Pin -	.3095	.3105	.0019	.0045
1775	Main Fuel Pump				
	Rear Link Bearing - - - - - - - - - - - - -	.3120	.3125		
	Pin -	.3095	.3105	.0015	.0030
1776	Main Fuel Pump				
	Front Mount Lug Bushing - - - - - - - - -	.3124	.3140		
	Pin -	.3094	.3105	.0019	.0045
1777	Main Fuel Pump				
	Link Bearing - - - - - - - - - - - - - - - - -	.3120	.3125		
	Pin -	.3095	.3105	.0015	.0030
1778	Front Fan Duct				
	Cover Plate Bushing - - - - - - - - - - - -	.3117	.3135		
	Main Fuel Pump Bolt - - - - - - - - - - - -	.3095	.3105	.0012	.0040
1779	Main Fuel Pump				
	Link Bearing - - - - - - - - - - - - - - - - -	.3120	.3125		
	Bolt -	.3095	.3105	.0015	.0030

Table 1. Engine External Parts - Fits and Clearances (See FO-1.) (continued)

Ref No.	Name	Dimensions for Ref		Limits	
		Min	Max	Min	Max
1780	Front Fan Duct				
	Cover Plate Lug - - - - - - - - - - - - - -	.4375	.4385		
	Bushing - - - - - - - - - - - - - - - - - - -	.4381	.4386	.0004T	.0011T
1781	Reduction Gearbox				
	Housing - - - - - - - - - - - - - - - - - - -	4.625	4.627		
	Main Fuel Pump - - - - - - - - - - - - - - -	4.621	4.623	.002	.006
1783	Rear Fan Duct				
	Mount Lug - - - - - - - - - - - - - - - - - -	.312	.314		
	Bolt -	.307	.308	.004	.007
1784	Aug Fuel Control				
	Bushing - - - - - - - - - - - - - - - - - - -	.312	.314		
	Bolt -	.307	.308	.004	.007
1785	Rear Fan Duct				
	Mount Lug - - - - - - - - - - - - - - - - - -	.312	.314		
	Bolt -	.307	.308	.004	.007
1786	Aug Fuel Control				
	Bushing - - - - - - - - - - - - - - - - - - -	.312	.314		
	Bolt -	.307	.308	.004	.007
1787	Aug Fuel Pump				
	Mount Lug - - - - - - - - - - - - - - - - - -	.3425	.3435		
	Bolt -	.3405	.3420	.0005	.003
1788	Fwd Fan Duct - - - - - - - - - - - - - - - -	.3425	.3435		
	Bolt -	.3405	.3420	.0005	.003
1789	Aug Fuel Pump				
	Mount Lug - - - - - - - - - - - - - - - - - -	.251	.252		
	Bolt -	.2494	.2499	.0011	.0026
1790	Aug Fuel Pump				
	Clevis -	.251	.252		
	Bolt -	.2494	.2499	.0011	.0026

Table 1. Engine External Parts - Fits and Clearances (See FO-1.) (continued)

Ref No.	Name	Dimensions for Ref		Limits	
		Min	Max	Min	Max
1791	Aug Fuel Pump				
	Clevis -	.251	.252		
	Bolt -	.2494	.2499	.0011	.0026
1792	Fwd Fan Duct				
	Mount Lug - - - - - - - - - - - - - - - - - -	.251	.252		
	Bolt -	.2494	.2499	.0011	.0026
1793	Aug Fuel Pump				
	Mount Lug - - - - - - - - - - - - - - - - - -	.251	.252		
	Bolt -	.2494	.2499	.0011	.0026
1794	Fwd Fan Duct				
	Clevis -	.251	.252		
	Bolt -	.2494	.2499	.0011	.0026
1796	Aug Fuel Control				
	Bushing - - - - - - - - - - - - - - - - - - -	.312	.314		
	Bolt -	.307	.308	.004L	.007L
1797	Mount Link				
	Bearing - - - - - - - - - - - - - - - - - - -	.3120	.3125		
	Bolt -	.307	.308	.004L	.0055L
1798	Mount Link				
	Bearing - - - - - - - - - - - - - - - - - - -	.3120	.3125		
	Bolt -	.308	.310	.002L	.0045L
1799	Rear Fan Duct				
	Lug -	.312	.314		
	Bolt -	.308	.310	.002L	.006L
1800	Side Clearance				
	Seal Ring Holder - - - - - - - - - - - - - -	.2605	.2615		
	Seal Ring Retainer - - - - - - - - - - - - -	.2620	.2630	.0005	.0025
1801	Bleed Valve Link - - - - - - - - - - - - - -	.2510	.2525		
	Bolt -	.2500	.2505	.0005	.0025

Table 1. Engine External Parts - Fits and Clearances (See FO-1.) (continued)

Ref No.	Name	Dimensions for Ref		Limits	
		Min	Max	Min	Max
1802	Bleed Valve Cylinder -----------	.2510	.2525		
	Bolt -----------------------	.2500	.2505	.0005	.0025
1803	Bleed Valve Link --------------	.436	.440		
	Bleed Valve Cylinder -----------	.429	.431	.005	.011
1806	Turbine Borescope Plug ----------	.371	.373		
	Turbine Case ------------------	.375	.377	.002	.006
1807	Diffuser Borescope Plug ---------	.552	.556		
	Diffuser Case -----------------	.558	.564	.002	.012
1808	12 Stage Borescope Plug ---------	.405	.407		
	Cprsr Stator Segment -----------	.409	.413	.002	.008
1811	7 Stage Borescope Plug ----------	.396	.400		
	4-9 Stage Case & Stator Assy -----	.403	.409	.003	.013

Table 1. Engine External Parts - Fits and Clearances (See FO-1.) (continued)

Ref No.	Name	Limits Min	Limits Max

CAUTION

The following clearances shall be maintained to prevent chafing of tubes due to tube movement caused by engine vibration. Failure to maintain clearance may result in tube chafe-through resulting in subsequent loss of fuel or oil.

NOTE

The supported section of a tube assembly is the 6 inch section on either side of a fixed loop clamp/bracket combination or 6 inches from a fixed end.

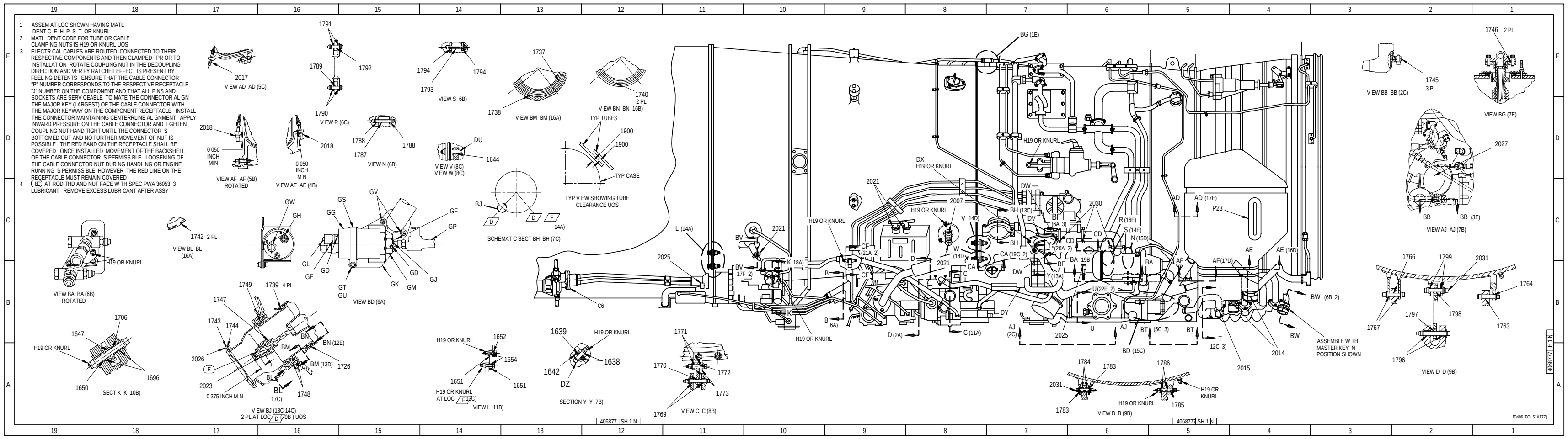
Ref No.	Name	Min	Max
1900	Clearance between the supported section of a tube assembly and any adjacent tube or structure. -	.030	
	Clearance between the supported section of any tube assembly and any operating mechanism. - -	.090	
	Clearance between the unsupported section of any tube assembly and any adjacent tube or structure. -	.090	
	Clearance between the unsupported section of any tube assembly and any operating mechanism. - -	.120	
	Visual evidence of chafing between tube assemblies and other adjacent parts is not acceptable. -		

Table 2. Engine External Parts - Torque Limits (See FO-1.)

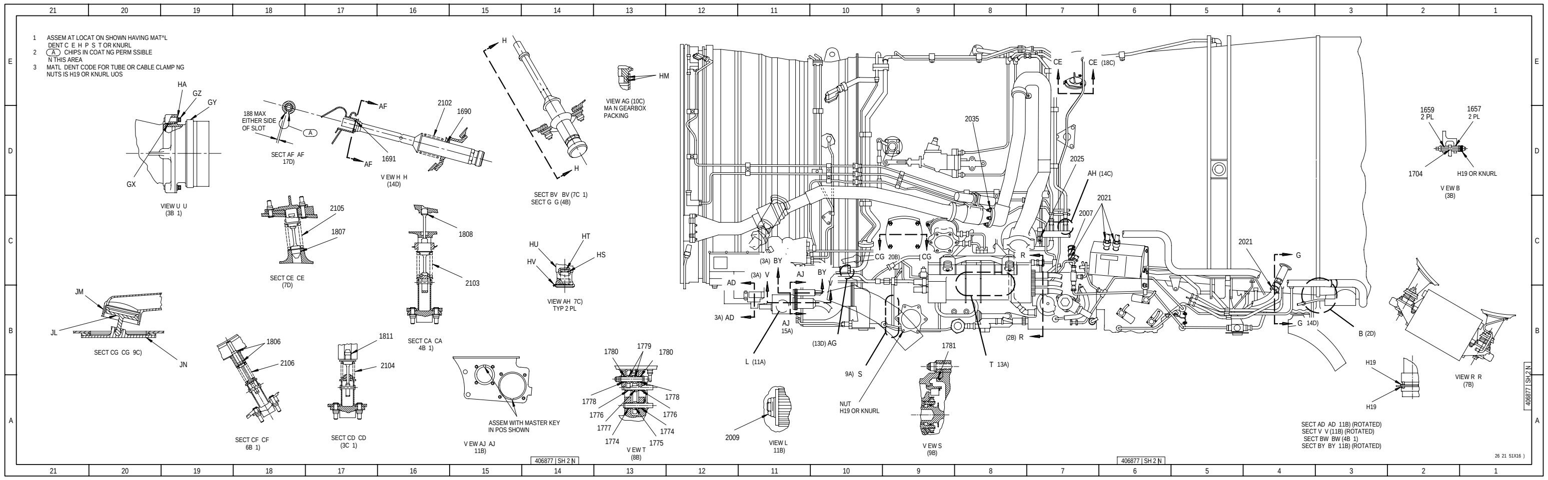
Ref No.	Name	Limits	
		Min	Max
2007	Main engine gas turbine igniter plug - - - - - - - - - -	300	360
2009	Alternator rotor nut -	250	300
2014	Lubrication oil tank adapter - - - - - - - - - - - - - - -	50	75
2015	Drain and sampling oil tank valve assembly - - - - -	50	75
2017	Upper oil tank strap assembly nut. Check run-on torque through locking feature of nut and adjust strap assembly to match tank contour, if necessary. Then preload bolt by torquing additional 7 to 10 lb-in. above run-on torque.		
2018	Lower oil tank strap assembly nut. Check run-on torque through locking feature of nut and adjust strap assembly to match tank contour, if necessary. Then preload bolt by torquing additional 7 to 10 lb-in. above run-on torque.		
2020	RCVV linkage sleeve nut - - - - - - - - - - - - - - - - - - -	250	275
2021	Igniter cable coupling nut - - - - - - - - - - - - - - - - -	140	160
2023	Cabin air bleed support rod nut - - - - - - - - - - - - -	250	270
2025	Tube coupling clamp nut (air supply line) - - - - - -	30	50
2026	Grooved coupling clamp nut (high compressor discharge air bleed) - - - - - - - - - - - - - - - - - - -	110	130
2027	Main Fuel Pump Filter Bowl Torque Bowl Until Flange Contacts Housing. Do not exceed 200 lb-in. - - -	(See Note)	
2030	Tube Coupling Clamp Nut Air Supply Line - - - - - - -	55	70
2032	DEEC Cooling Tube Fitting Nut - - - - - - - - - - - - - - -	70	80
2033	Hinged Loop Clamp Screw - - - - - - - - - - - - - - - - - - -	22	36
2034	Bleed Valve Strap Cylinder Support - - - - - - - - - - -	52	90
2035	Anti-ice Valve Locknuts - - - - - - - - - - - - - - - - - - -	62	72

Table 3. Accessories - Spring Pressures (See FO-1.)

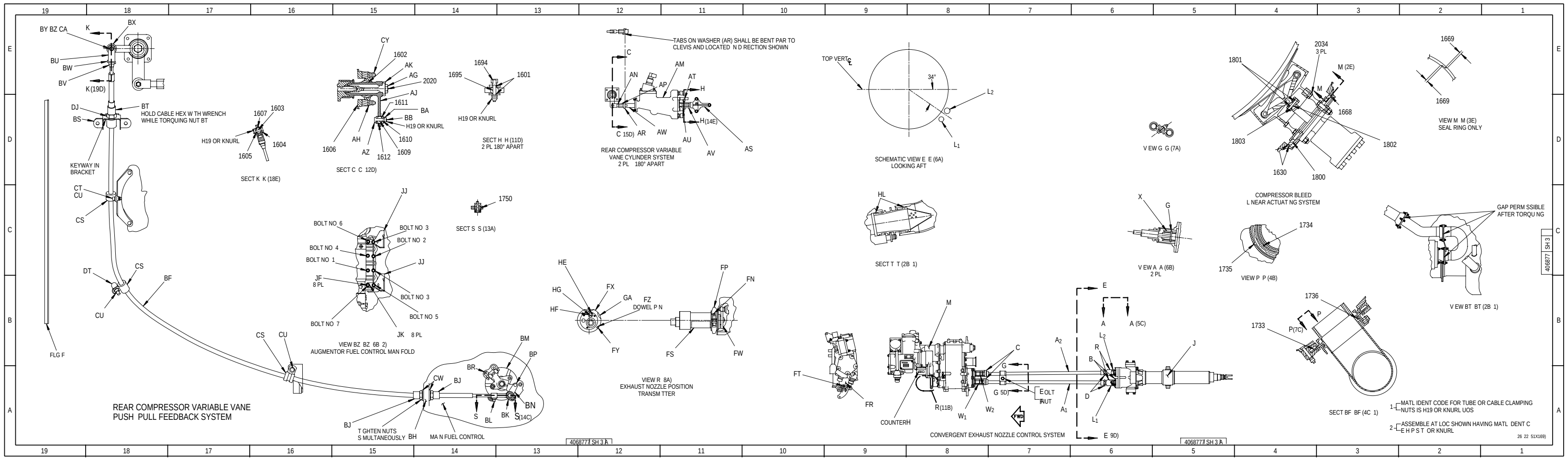
Ref No.	Name	Limits	
		Min	Max
2102	Augmentor igniter spring		
	at 0.962 inch -	82.625	93.375
	at 1.446 inches -	16.625	27.375
2103	Borescope plug spring		
	at 1.761 inches -	209.250	244.625
	at 1.854 inches -	137.875	155.500
2104	Borescope plug spring		
	at 1.163 inches -	20.000	23.750
	at 1.213 inches -	17.250	19.125
2105	Borescope plug spring		
	at 1.652 inches -	303.250	329.750
	at 1.864 inches -	129.250	146.875
2106	Borescope plug spring		
	at 1.215 inches -	16.125	19.875
	at 1.260 inches -	13.625	15.500



FO-1. Engine External Parts - Fits and Clearances (Sheet 1 of 3)



FO-1. Engine External Parts - Fits and Clearances (Sheet 2 of 3)



FO-1. Engine External Parts - Fits and Clearances (Sheet 3 of 3)